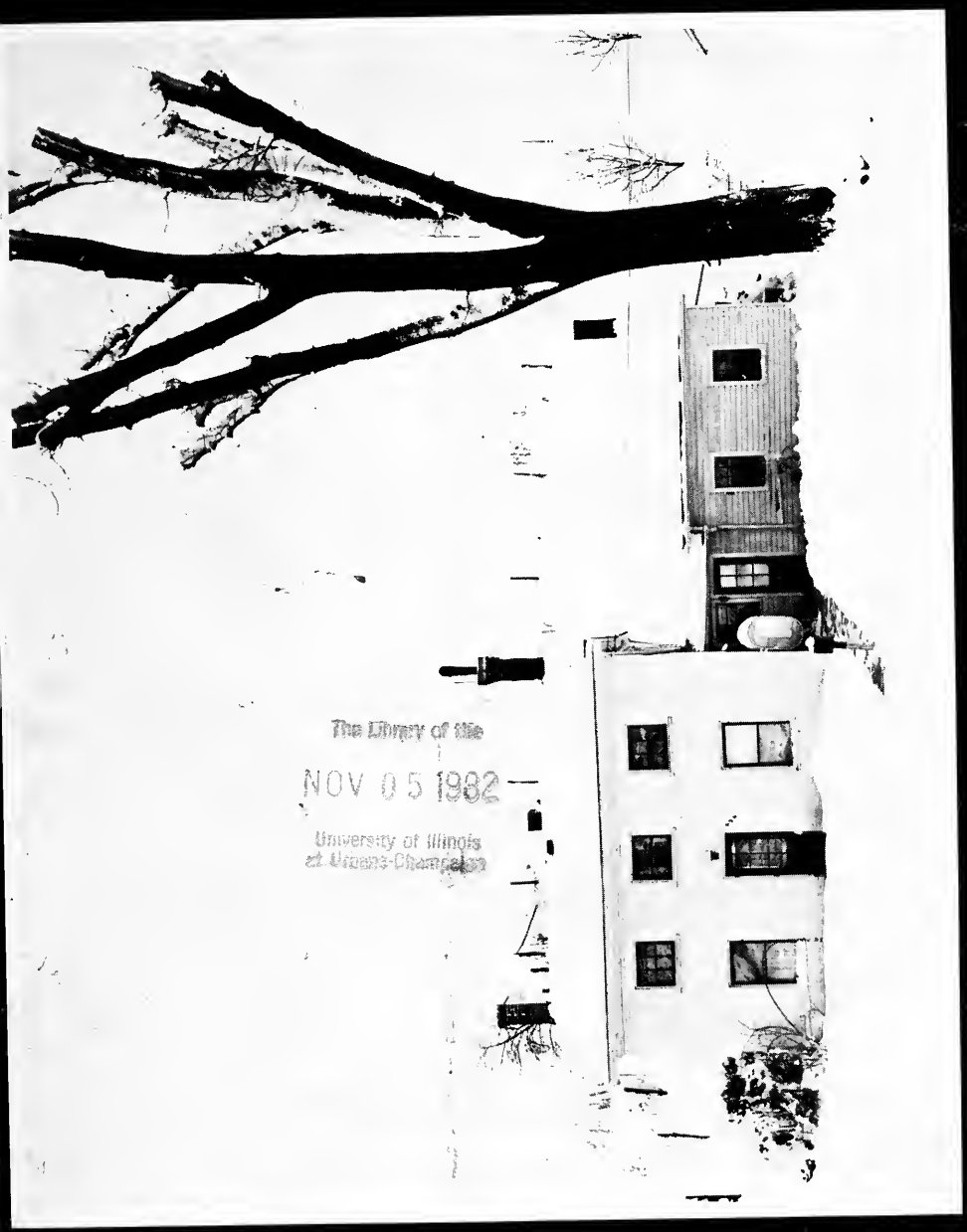
Review of Research in Visual Arts Education



Winter 1982

Number 15

Review of Research in Visual Arts Education

Proceedings of The National Symposium for Research in Art
Learning in Art: Representation and Metaphor

Winter 1982 Number 15

The **Review of Research in Visual Arts Education** is published twice yearly (fall and winter) by the Office of Continuing Education and Public Service and the Department of Art and Design, University of Illinois, Urbana, Illinois 61801. Subscriptions are $10.00 for one year; single issues are $6.00. Checks and money orders should be made payable to the **University of Illinois.** Payment must be enclosed. Mail remittance to:

Editorial Office
143 Art and Design Building
4th St. and Peabody Drive
University of Illinois
Champaign, Illinois 61820

Second-class postage approved at Urbana, Illinois.

Contents

Articles

THE PERSISTENCE OF THE PERPENDICULAR PRINCIPLE: WHY, WHEN AND WHERE INNATE FACTORS DETERMINE THE NATURE OF DRAWINGS

Brent Wilson
Marjorie Wilson

Introduction

We thought we saw a foolish cow
Standing on her head
We looked again and saw her
Perpendicular instead
"We wonder why," we were heard to cry,
"To this muddle she was led."
(with apologies to Lewis Carroll)

The aforementioned cow is only one of sixteen that cling tenaciously at right angles to a mountain path, regardless of whether the path slopes gently upward or plunges downward and turns at such extreme angles that our cow does appear to be hanging head down, while another adheres to the path's underside as a fly clings to a rafter. The path, the mountain, a dog, two people and the sixteen perpendicularly attached cows appear in a drawing reproduced in Henry Schaefer-Simmern's *The Unfolding of Artistic Activity* (1948). The drawing is one of a series by Miss "E," a 33-year-old woman whose perpendicular orientation of objects to a baseline Schaefer-Simmern attributes to a stage of visual conceiving — the stage of the greatest contrast in direction of lines. He notes, however, that the illusion of distance shown by the gradual diminution in the size of the cows from the lower to the upper parts of the drawing is based upon the woman's "spontaneous visual experience" (Schaefer-Simmern, 1948, pp. 131-141). Schaefer-Simmern expresses concern that there might seem to be an inconsistency between the perpendicular-to-the-baseline orientation of the cows and their diminution in size, contradicting his assertion that "the unity of form is an essential characteristic of any organically developing process of visual configuration" (Schaefer-Simmern, 1948, p. 138). Something, it seems, was muddying Schaefer-Simmern's explanatory waters. For Schaefer-Simmern and, we might add, for many others, "artistic unfolding" is entirely an innate and organic process — indeed it is believed that in order for the process to be properly achieved it *should be* — it *must be* — natural and unfettered. No piece of evidence, however inconsistent, has been allowed to interfere with his beliefs.

The confusion of Schaefer-Simmern and others between what they wish to be the case and what is actually the case, leads to the systematic disregard for some aspects of graphic development and the exaggeration of others. If we are to understand graphic development it seems necessary to take a more rigorous and careful look at the full range of factors that affect this development. As the path to that understanding we have chosen to begin with Miss "E's" curious gravity-defying perpendicularly-oriented cows.

This investigation was supported in part by a grant from The Institute for the Arts and Humanistic Studies at The Pennsylvania State University.

The authors wish to recognize the assistance of Barbara Roberts in collecting the data, Ralph Raunft and Ken Bojrab in scoring the data and Jon Lemke in the statistical analysis of the data.

Additional unpublished graphic materials supporting this research are available from the editorial office of the Review of Research in Visual Arts Education.

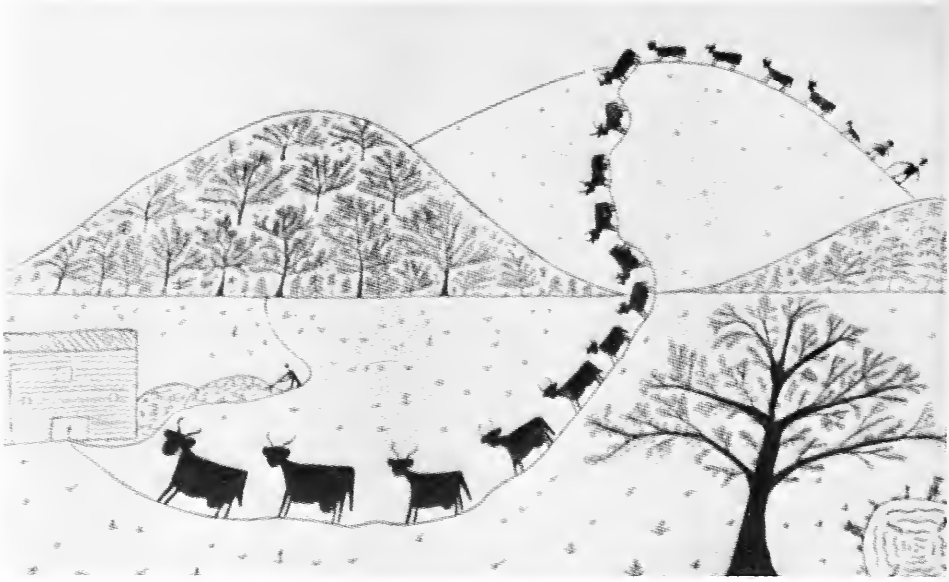


Figure 1. "Taking the Cows Home from the Hill." Collected by Schaefer-Simmern.

Schaefer-Simmern reports that, sometime after drawing her upside-down cows, Miss "E" drew cows on horizontal baselines because, she wrote "no longer wishing to see the cows coming downhill at such awkward angles, I had to draw a serpentine pathway which gave me the opportunity of placing all the cows right-side-up" (Schaefer-Simmern, 1948, p. 139). We wish to raise the specific question "What led Miss 'E' to subject her cows to the laws of gravity rather than to those of innate graphic order?"; and from this specific question we will raise the whole issue of the interplay of nature and nurture in graphic development.

The Nature of Innate Theories of Graphic Development

Nearly all theories of drawing development are predicated on the single assumption that the unfolding of graphic achievement is determined by the child's stage-by-stage application of a series of innate factors or rules. These factors have not been set down in one place or integrated into one comprehensive theory; rather they have been identified singly or in small clusters by psychologists, art educators and others interested in artistic development. Among the rules are: (1) keep shapes undifferentiated and simple for as long as possible while still achieving graphic goals (Arnheim, 1974, p. 181); (2) achieve the greatest possible contrast of lines, often through a horizontal/vertical orientation (Schaefer-Simmern, 1948, pp. 11-21); (3) orient objects in a perpendicular fashion to the nearest baseline (Piaget and Inhelder, 1956, pp. 375-417); (4) end-anchor and attach limbs to the largest mass (Freeman, 1975); (5) depict conceived as well as perceived information (Luquet, 1913, 1927); and (6) avoid overlap and provide each object with its own space (Goodnow, 1977, pp. 40-46). It is interesting to note in passing that most art educators writing on children's art have been content to *describe* the characteristics of age-based develop-

mental stages, but they have generally eschewed the *explanatory* power afforded by the innate rules.

Although explanations of graphic development arising from these and other innate rules and factors have not been extended to their logical conclusions, we might expect that extensions in which development proceeds from a lower to a higher level would take one or more of the following forms: (1) innate factors have structures ranging from simple to complex through which the child moves in sequence; (2) a more advanced form of some innate factor replaces a more basic form of innate factor; (3) one innate factor is replaced by an entirely different factor; or (4) the range of application of a rule is increasingly more restricted, i.e., the rule is applied less and less generally. Each of these explanations assumes the graphic learner's growing cognitive ability to handle increasing complexity and his increasing ability to note discrepancies between that which has been drawn and that which has been perceived in the phenomenal world. Once noted, these discrepancies presumably trigger in the individual the desire to reduce the discrepancy by inventing a new graphic equivalent for the phenomenal perception. This, in turn, demands a different or higher level application of one or more innate graphic factors. This would seem to be the theoretical concept implicit in Schaefer-Simmern's formulation. Although he recognizes that phenomenal perceptions alter the nature of drawings and presumably also affect the application of innate factors, this point seems not to have been fully acknowledged nor its implications investigated. Much the same might be said for the work of Lowenfeld (1963) as he sees the child moving from the *scribbling stages* through *dawning realism* and the *pseudo-realistic stage*. Luquet (1913 and 1927) too, divided development into stages including those of: *intellectual realism* where the younger child applies internal graphic factors in order to draw what he knows about things and *visual realism* where the older child draws or at least attempts to draw things as they appear to him in the phenomenal world. In these and other explanations of graphic development it is not clear what happens to the innate factors with the onset of *visual realism* or *pseudo-realism*. Are the innate factors gradually but finally replaced by non-innate graphic factors? Or do the innate rules continue to exist in some diminished role as they become submerged or overridden by new governing factors? It seems that the strong theoretical reliance on the primary and pervasive role of the innate rules in graphic development has impeded the investigation of factors other than the innate which might determine the nature of graphic development. In this paper we propose to (1) investigate the nature of both the innate and non-innate principles that affect graphic development, (2) to investigate the nature of the interaction between these two types of principles, and (3) to investigate the conditions under which one or the other of the principles dominate.

The Study

Miss "E" drew the path for her cows. We provided a hill for our subjects — one with a slope of 40 degrees on either side. Subjects were asked to draw a figure walking one-half way up one side of the hill and another walking one-half way down the other. We observed the means by which subjects of different ages oriented their figures to the baseline. These observations, we assumed, would provide the basis for insights into whether subjects' productions were governed by an innate factor or by some other.

The Subjects

Four hundred and sixty-five subjects participated in the study. The subjects were divided into four groups: the first group of 112 subjects consisted of two five-year-olds, 83 six-year-olds and 34 seven-year-olds; the second group of 123 subjects consisted of 85 eight-year-olds, 30 nine-year-olds and eight ten-year-olds; the third group of 82 subjects consisted of four eleven-year-olds, 15 twelve-year-olds, 19 thirteen-year-olds and 44 fourteen-year-olds; and the fourth group consisted of 148 young adults ranging in age from 18 to 36. Approximately one-half of the subjects in each of the four groups came from the East Central region of the United States and the other half from the Southeastern region of the United States.

Scoring

The angle of both up-hill and down-hill figures in each drawing was analyzed in relation to the angle of the hill on which it was placed and to the page itself by (1) measuring the number of degrees by which a figure departed from the vertical (a figure parallel to the side of the page and perpendicular to the bottom of the page or baseline was scored as zero degrees, while a figure that was perpendicular to the slope of the hill was scored as 40 degrees); by (2) indicating whether the figures were (a) stick, (b) shown front-view, profile, or mixed profile and front-view, (c) whether the legs were straight or bent and (d) whether the legs were of different lengths; and by (3) classifying whether (a) two feet were on the surface of the hill, (b) only one foot was on the surface, (c) two feet were off the surface of the hill, (d) one foot was below the surface of the hill, (e) and whether two feet were below the surface of the hill.

Statistical Analysis

From simple plots of the angle of the figures in relationship to the other variables, it became immediately clear that the use of measures of central tendency such as mean and median would provide either few or distorted views about the governing role of the innate perpendicular factor and the non-innate vertical factor. In fact not only were the measures of central tendency seen to have little value but tests used to compare them would be inappropriate since the distributions were found to (1) be skewed to the left (both unimodally and bimodally) where the vertical factor governed, (2) skewed to the right (both unimodally and bimodally) where the perpendicular factor governed, (3) symmetrical where a tension between the perpendicular and the vertical factors were heaviest and (4) symmetrical but bimodal where both the perpendicular and vertical factors governed equally. Since the variances of the distributions were found to be unequal, it became necessary, in order to discuss the governing role of the perpendicular and vertical factors, to view the proportion of subjects that were governed by the perpendicular and vertical factors as well as those subject to the tension between them. Thus subjects who oriented figures between −10 to 10 degrees of being perpendicular to the base of the hill were considered to be governed by the vertical factor; subjects who oriented figures 11 to 29 degrees from the vertical were considered to be in the region of tension; and subjects who oriented figures between 30 to 50 degrees from the vertical were considered to be governed by the perpendicular factor. Subjects orienting figures beyond these regions were considered outliers and were excluded from further analysis because of the strong distorting influence they would have had on the measures.

It was necessary to use two separate analyses, one for the figure walking uphill and another for the downhill figure because the distributions of the two angles of orientation were distinctly different (there were, for example, more bimodal occurrences for downhill figures). Indeed the two tasks were somewhat unrelated, as the data show. For example, it would not be possible to predict the type of surface contact for the downhill figure on the basis of the surface contact of the uphill figure, nor were differences in leg length predictable from downhill to uphill figures.

In an initial analysis the variables (1) stick figure, (2) front, profile and mixed views, and (3) the sex of the subject were found to be independent of all other variables or conditionally independent of angle and were therefore climinated from further analysis. Instances in which either two feet, or only one foot broke the surface of the hill or disappeared behind the hill were infrequent and were pooled into one larger category of breaking-the-surface. Thus the initial 4032 cross-classifications were reduced to 192.

Finally, although the tables were still sparse the displays of age x bent-legs x leg-length x surface contact showed that the huge majority of sparse cells occurred when the legs were bent. The bent-leg variable had a very complex interaction structure with the other variables. By conditioning the variable on bent legs it was found that figure-orientation angle was completely independent of all other variables. This separate analysis of bent legs had important theoretical implications that will be discussed later.

The analyses, then, were made to estimate the extent to which the perpendicular and vertical factors and the tension between them governed in relation to the age of the subject, the angle of figure orientation, whether legs were bent or lengthened and the nature of the contact with the surface of the hill.

Findings

Two major sets of findings will be presented. The first contains estimates of the number of individuals to be influenced by the perpendicular factor when the legs of figures are not bent, the second contains estimates of the influence when legs are bent.

Analysis of the Figure-Baseline Orientation When Legs Are Not Bent. Through the application of log-linear models to the cross classified data it was found that the response variable angle-of-figure-orientation interacted simultaneously with the variable of legs-of-different-lengths, the various types of contact with the baseline of the hill, and with the age of the subject. The appropriate log-linear model fit to the data, then, contains the structural third-order interaction of age, leg length and surface contact; the second-order interaction of the angle-of-orientation with leg length and surface contact; and the first-order interaction of the response angle with age. Tables 1 and 2 present the maximum likelihood estimates for the proportions that fall into the perpendicular, vertical and tension angle groupings for each of the 32 cross-classifications.

In order to indicate as simply as possible just what these tables show we shall illustrate the data by presenting examples of features of the up- and down-the-hill drawings.

Floating Leg. When subjects depicted one foot on the hill and the other floating freely (Figure 2) there was more likelihood that the figure would be in the vertical or tension regions than in the perpendicular region for both uphill and downhill figures. In other words, although the governing power of the perpendicular was present especially for the downhill figures, the one-foot-on-one-foot-off solution seemed to be quite a useful

TABLE 1

Estimates of the Maximum Likelihood That Uphill Figures With Unbent Legs Will Be Oriented in the Vertical, Tension and Perpendicular Regions

Surface	Leg Length	Group	Percentage Vertical	Tension	Perpendicular
One Foot Off Surface	Legs Same Length	One	*43.88*	41.27	14.85
		Two	*46.69*	42.40	10.91
		Three	*41.73*	37.93	20.33
		Four	*61.73*	27.00	11.27
	Legs Different Lengths	One	*42.49*	30.86	26.65
		Two	*46.84*	32.87	20.29
		Three	*38.38*	26.93	34.69*
		Four	*59.64*	20.16	20.20
Two Feet Off Surface	Legs Same Length	One	30.25	*40.52*	29.23
		Two	33.78	*43.69*	22.53
		Three	27.12	35.12	*37.76*
		Four	*46.60*	29.08	24.32
	Legs Different Lengths	One	*41.34*	31.49	27.17
		Two	*45.67*	33.60	20.73
		Three	*32.27*	27.40	35.33*
		Four	*58.50*	20.75	20.75
Foot Breaks Surface	Legs Same Length	One	*41.32*	35.80	22.88
		Two	*45.06*	37.71	17.23
		Three	*37.95*	31.76	30.29
		Four	*58.74*	23.71	17.56
	Legs Different Lengths	One	*49.22*	23.32	27.46*
		Two	*54.25*	24.84	20.91
		Three	*44.22*	20.24	35.55*
		Four	*65.70*	14.51	19.79
Two Feet on Surface	Legs Same Length	One	9.36	*46.73*	43.91
		Two	11.04	*53.22*	35.75
		Three	7.95	38.33	*53.72*
		Four	17.07	39.70	*43.23*
	Legs Different Lengths	One	*54.68*	37.77	7.54
		Two	*56.74*	37.86	5.41
		Three	*53.59*	35.76	10.65
		Four	*71.62*	23.04	5.33

* Bimodal distributions; higher percentage in the distribution is italicized.

means for orienting figures toward the vertical. It is also important to note that three of the four distributions for downhill figures are bimodal, indicating that there was a tendency for subjects to be influenced either by the vertical or the perpendicular for the downhill application of this variable. It appears then that the subjects had implicitly determined which polar extreme would govern their figure orientation, thus reducing the use of the tension area between the poles.

The depiction of legs of differing lengths with one foot off the surface would appear to increase the likelihood of subjects' achieving a vertical figure orientation, yet the estimated proportions are very much like those for one-foot-off with legs of the same length. Perhaps the orientation was established and the leg lengthened

TABLE 2

Estimates of the Maximum Likelihood That Downhill Figures With Unbent Legs Will Be Oriented in the Vertical, Tension and Perpendicular Regions

Surface	Leg Length	Group	Percentage Vertical	Tension	Perpendicular
One Foot Off Surface	Legs Same Length	One	*46.48*	26.09	27.47*
		Two	30.52	32.46	*37.01*
		Three	*47.18*	17.38	35.44*
		Four	61.00	11.51	27.49*
	Legs Different Lengths	One	*39.13*	29.76	31.12*
		Two	24.57	35.37	*40.05*
		Three	39.86	19.88	*40.26**
		Four	*53.71*	13.73	32.56*
Two Feet Off Surface	Legs Same Length	One	34.39	*35.14*	30.47
		Two	21.05	*40.72*	38.23
		Three	35.78	23.96	*40.25**
		Four	*49.52*	17.04	33.44*
	Legs Different Lengths	One	36.55	*56.74*	6.71
		Two	23.17	*68.09*	8.73
		Three	44.42	*45.22*	10.37
		Four	*60.16*	31.40	8.44
Foot Breaks Surface	Legs Same Length	One	31.28	*43.91*	24.82
		Two	18.92	*50.30*	30.78
		Three	34.15	31.44	*34.42**
		Four	*48.16*	22.73	29.11
	Legs Different Lengths	One	*57.57*	34.61	7.82
		Two	41.40	*47.09*	11.51
		Three	*63.84*	25.16	11.00
		Four	*76.60*	15.48	7.92
Two Feet on Surface	Legs Same Length	One	6.24	31.67	*62.10*
		Two	3.22	30.99	*65.79*
		Three	5.89	19.62	*74.49*
		Four	9.71	16.59	*73.70*
	Legs Different Lengths	One	*39.30*	38.69	22.01
		Two	24.93	*46.45*	28.62
		Three	*42.43*	27.39	30.18*
		Four	*56.89*	18.83	24.28*

* Bimodal distributions; higher percentage in the distribution is italicized.

merely to fill available space. For uphill figures the vertical factor governs in all four groups. For downhill figures the estimates are split, with the perpendicular factor governing most frequently for two groups and the vertical for two groups. This time four of the eight distributions are bimodal. Again these bimodal distributions point to the possibility that subjects were governed by one or the other of the extreme factors, diminishing the attraction to the other pole and thus diminishing the occurrence of responses within the tension region.

Floating Figures. As with subjects who depicted figures with one-leg-touching and one-leg-off the hill, subjects who drew figures floating freely above the hill were more likely to be influenced by the vertical than the perpendicular factor. In the 16 distribu-

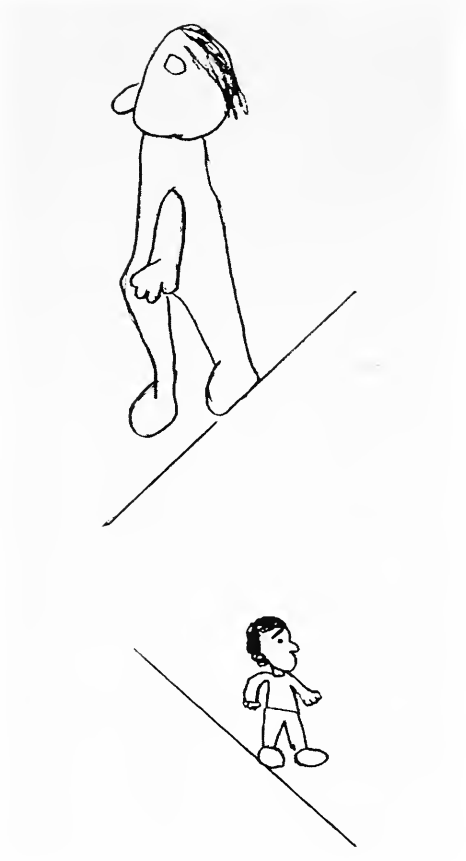


Figure 2. Floating Leg — Legs of the Same Length.

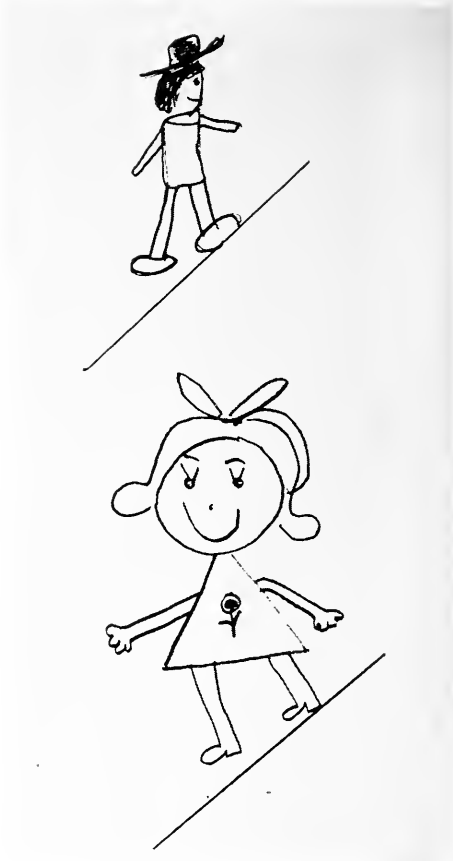


Figure 3. Floating Leg — Legs of Differing Lengths.

tions, the vertical factor governed seven times. Seven times the tension region predominated; in only two instances did the perpendicular factor govern. Indeed it was our informal observation that the more highly the figures floated above the hill the more likelihood there was that the figures would have a vertical orientation. Conversely, as floating figures were drawn closer to the baseline of the hill, it was almost as if a powerful magnet pulled them toward the perpendicular.

For floating figures, only three of the 16 distributions are bimodal. For uphill figures five of the eight distributions are skewed to the left, favoring the vertical region, while for downhill, five of the eight distributions favor the tension region. For downhill floating figures with legs of different lengths there was a less than ten percent chance that the figures would be governed by the perpendicular factor.

Figures Breaking the Surface. The depiction of the legs as breaking or going behind the surface was also an effective means by which subjects were able to achieve a more vertical figure orientation. All eight of the uphill distributions are strongly skewed to the left, favoring the vertical region, although it should be noted that three of the eight distributions are bimodal (where the legs were of different lengths). Four of the eight distribu-

Figure 4. Floating Figures — Legs of the Same and Differing Lengths.

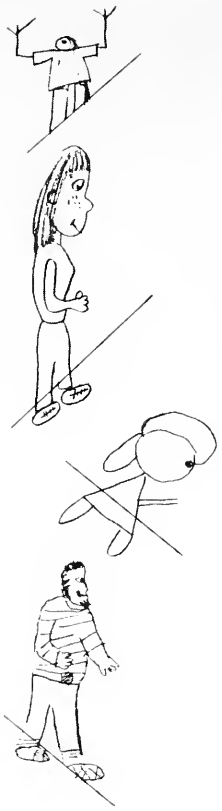


Figure 5. Figures Breaking the Surface.

tions for downhill figures are also skewed to the left, favoring the vertical; but only one of the eight distributions is bimodal. It is also worth noting that if, in downhill figures, the legs broke the surface and were of different lengths, there was only about a ten percent possibility that the orientation would be governed by the perpendicular factor.

Figures with Two Feet on the Surface. It is only when two legs of the same length are anchored to the surface of the hill that the full governing effect of the perpendicular factor is to be seen. Under such conditions for both up and downhill figures, 57% of the responses for the four age groups fall into the perpendicular region, while only 9% of the responses fall

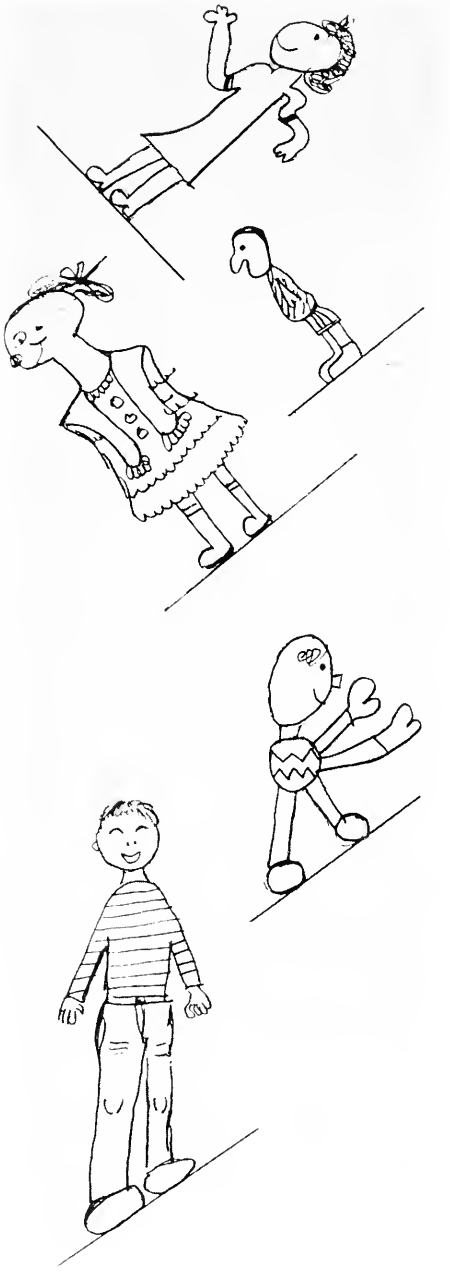


Figure 6. Both Feet on the Surface — Legs of the Same and Differing Lengths.

into the vertical region. These figures nearly reverse themselves when the legs are of differing lengths; 50% of the responses fall into the vertical range and only 17% fall into the perpendicular range. In other words, when the responses fell into the perpendicular region they were more likely to have been achieved by anchoring two legs of the same length to the baseline of the hill than by any other means.

Analysis of Figure-Baseline Orientation When Legs Are Bent. The bent-leg variable displayed a strong relationship to the variable age. Tables 3 and 4 show this relationship. In the first two age groups bent legs were virtually non-existent. Approximately 29% of the third age group and 51% of the oldest group depicted bent legs.

As indicated earlier, an examination of the data also revealed the need to analyze the bent-leg variable separately from the not-bent variables. By pooling the age groups and by condi-

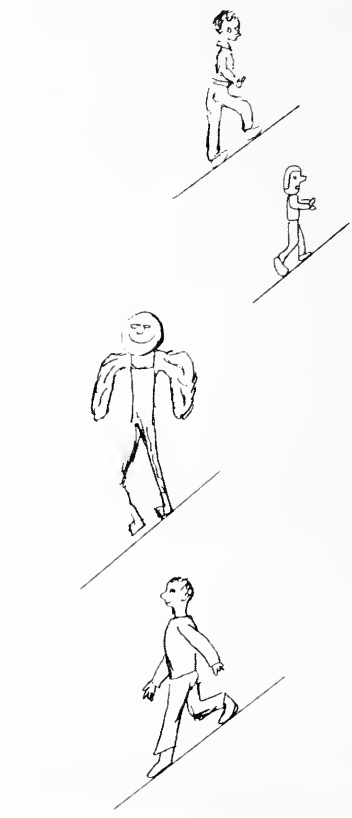


Figure 7. Figures with Bent Legs.

TABLE 3

The Relationship Between Age and the Drawing of Uphill Figures With Bent Legs

	AGE GROUP			
	1	2	3	4
Unbent Legs (No.)	111	119	56	67
Bent Legs (No.)	1	4	26	81

TABLE 4

The Relationship Between Age and the Drawing of Downhill Figures With Bent Legs

	AGE GROUP			
	1	2	3	4
Unbent Legs (No.)	112	119	61	79
Bent Legs (No.)	0	4	21	69

tioning on bent-legs it was found that angle of figure orientation was completely independent of all other variables. Table 5 shows the maximum likelihood estimates obtained for figure orientations in each of the three regions. Both distributions are strongly skewed to the left, indicating that bending legs was a highly effective means for orienting figures in the vertical region.

In order to compare figure orientations when legs are bent and not bent, Tables 6 and 7 (Summary Tables for Not-Bent) are presented. Comparisons of Tables 5, 6 and 7 show the strong relationship of the use of bent legs to a vertical figure orientation as compared to any of the non-bent variables — approximately 20% more for both up- and down-hill figures.

An examination of the summary tables also reveals these facts: (1) When the percentages for all groups were averaged for figure orientation in either the perpendicular or tension regions, it was found that over 60% of all subjects were influenced by the perpendicular factor. (2) The perpendicular factor is more likely to govern for downhill than for uphill figures, perhaps indicating that regardless of the means employed — whether bent or non-bent leg treatments and surface treatments — the downhill figure presented the more difficult task. (3) The perpendicular factor governed the second age group more strongly than it did the first age group (as indicated by the downhill data where 36% of the first age group oriented their figures in the vertical region while only 23% of the second age group did so). In other words, under certain conditions the governing power of the perpendicular factor actually becomes stronger with age before that power is finally diminished.

Now, what do all those data mean? What do they have to do with Miss "E's" cows, with innate and non-innate principles and with graphic development?

Theoretical Projections

We now wish to use these data in order to examine the origins and nature of the interactions of the factors associated with the orientation of fig-

TABLE 5

Estimates of the Maximum Likelihood That Figures With Bent Legs Will Be Oriented in the Vertical, Tension and Perpendicular Region

	Percentage		
	Vertical	Tension	Perpendicular
Uphill Pooled Groups	62.39	26.61	11.01
Downhill Pooled Groups	58.70	17.39	23.91

TABLE 6

Summary of Maximum Estimates of Percentages of Uphill Unbent Figures That Will Be Oriented in the Vertical, Tension and Perpendicular Regions

Group	Vertical	Tension	Perpendicular
1	*39.07*	35.97	24.96
2	*42.51*	38.27	19.22
3	*35.40*	31.68	32.29
4	*54.95*	24.74	20.31
TOTAL	42.98	32.67	24.20

TABLE 7

Summary of Maximum Estimates of Percentages of Unbent Downhill Figures That Will be Oriented in the Vertical, Tension and Perpendicular Regions

	Region		
Group	Vertical	Tension	Perpendicular
1	36.37	*38.20*	26.57
2	23.47	*43.93*	32.59
3	39.19	26.26	34.55*
4	*53.09*	18.41	29.62
TOTAL	38.03	31.70	30.83

* Bimodal distribution; the highest percentage is italicized in each distribution.

ures in the up-and-down-the-hill task. In other words, what might these data mean when used in the generation of hypotheses about graphic production?

Our first and most essential assertion is that in each graphic configuration there are two potent principles — the *innate* and the *influence*. Briefly, the innate principle governs such things as basic simplicity and compositional order — the manner in which the parts of configurations are related spatially. The influence principle governs differentiation and the stylistic aspects of configurations. Each principle is multifaceted, comprised of various factors; but before a closer examination, it is important to discuss the theoretical implications of postulating two graphic principles rather than one.

Although those who explain graphic development by innate principle alone have not been greatly concerned about how the innate principle functions with older children, with adults (Schaefer-Simmern is perhaps the exception) and especially not with adult artists. Yet, whether the innate principle diminishes in power, is somehow gradually but totally replaced, or continues to influence in some weakened or diminished state seems a most central question. This question is important because "child art" is not an end state (Day, 1979, p. 11) but a route through which one travels toward some higher or at least some different graphic end. A full map of that route is the key, of course, to the understanding of graphic development and, by extension, to the understanding of artistic development. Following only innate "routes" leaves us far short of our destination.

Projecting two co-existing governing factors eliminates the knotty and perhaps even unsolvable problems of establishing when the influence principle begins and determining the eventual fate of the once singular and all powerful innate principle. With the positing of the two principles an ex-

plication of the nature of each seems the next order of business, followed by an examination of the relative influence of each principle at anytime during development, an exploration of the interplay among factors within each of these two general principles and finally and most importantly, an investigation of the interactions between the two general governing principles. We wish now to examine the nature of the innate and the influence principles as we think they functioned in the up-and-down-the-hill task and then explore some of the interactions between them.

As we examine these two principles it is important to note that they should be considered to be mental phenomena. The interaction between them occurs as a cognitive operation. In other words graphic configurations are behavioral manifestations of cognitive operations. As such, these configurations might contain isolated features that may be pointed to as pure or as nearly pure instances of the innate, and others, of the influence. At the very beginning of graphic development it is possible for a configuration to appear to manifest only innate factors. This fact notwithstanding, most configurations manifest at least traces of each.

Even when the configurations do not manifest the fetures of either the innate or influence principles, the two factors are functioning, but either the influence has not developed sufficiently to produce behavioral evidence or, in the case of the highly skilled artist, the innate factors have been virtually overridden. (We might add parenthetically that, depending on conditions, a highly skilled artist may produce images that are strongly influenced by the innate. We once watched an artist, prominent enough to have exhibited in the Venice Biennale, resort to drawing tadpole figures in order to quickly illustrate a point that he was making.) As we now begin discussing features found in the up-and-down-the-hill drawings, it is important to remember that these are isolated manifestations of one or the other of the principles. The images as a whole display both.

The innate principles in the up-and-down-the-hill task. When subjects oriented their figures in the perpendicular and tension regions, they were following, to a greater or lesser degree, the innate predisposition to order objects at right angles to the nearest baseline (Piaget and Inhelder, 1956, pp. 375-417) in order to achieve the maximum horizontal/vertical contrast of lines and shapes (Schaefer-Simmern, 1948). When legs of figures were not bent, subjects were keeping shapes undifferentiated while still achieving their graphic goals (Arnheim, 1974, p. 181). In an overwhelming number of the responses, the figures were drawn walking on the baseline of the hill rather than behind the ridge line or on the implied plane of the hill. This on-the-baseline response seems to be conditioned by an innate factor — the desire to avoid overlap or to provide each object with its own space (Goodnow, 1977, pp. 40-46) even if it is only a figure overlapping a part of the hill. There seems also to be a strong innate prohibition against crossing the baseline of the hill, thus affecting those subjects who may have been inclined to place figures on the plane of the hill. Placing part of the figure behind the baseline of the hill would also have prevented subjects from showing a maximum amount of information about a figure or from drawing what they knew to be present in such situations (Freeman and Janikoun, 1972). One other important point should be made about the use of the baseline: the youngest group were far less apt to anchor legs to the ridge of the hill than any of the other groups. They floated figures above the hill and occasionally sank them into the plane of the hill. There

are at least two possible explanations for the "floating" and "sunken" figures of the first group. The first is that some five-, six- and seven-year-olds might have wished to place the figures on the baseline, but they simply did not have enough skill to accurately anchor them — they were poor marksmen. The second possibility is that they simply had no innate propensity to use the ridge baseline. If this were the case then some other principle would seem to be in effect, stated as: "when showing relationships of objects, it is sufficient to place them on the same page." We discount the second possibility since it seems highly unlikely that innate factors come and go. It seems much more probable that the anchor-to-the-baseline rule was in effect but that some children did not yet have the graphic skill to provide behavioral evidence of the effect, or that they were applying the factor in some, as yet, unknown manner.

One of the most important observations to be made about the data is that the innate factors were strongest when they joined forces. When subjects used the baseline, kept legs unbent, attempted to show a maximum amount of information and avoided overlapping, their figures were far more likely to fall into the perpendicular region.

One of the most curious phenomena to be noted, however, was the manner in which subjects used one or more innate factors to overcome another innate factor. When subjects moved their figures into the tension or vertical regions, they often did so either by lengthening one leg to fill the extra space created, or to "push" the figure toward the vertical. In instances where one foot of an unbent leg was anchored to the baseline and the other was left suspended in space over the hill so that the figure might be oriented more vertically, we have the opportunity to observe the acceptance of one gravity-defying improbability — walking on air — in order to avoid another — the perpendicularly-oriented figure.

Thus we have seen that the various innate factors sometimes joined forces, leading subjects to produce figures in the perpendicular region. At other times innate principles were used in order to enable subjects to orient figures toward the vertical.

The influence principle in the up-and-down-the-hill task. Whereas previous inquiry into graphic development has made easy the identification of the innate factors, that same inquiry makes difficult our task of identifying influence factors. The primary reason for the difficulty is that in most innatist accounts of graphic development the influence factors are assumed to be higher order manifestations of innate principles. However, three dimensions of what might be considered the influence principle have been posited (Willats, 1979). Although Willats eventually attempts to refute the role of all three dimensions, he does characterize a view of graphic development in which the child draws from his knowledge of "stereotypes." He presents three possible sources for these "stereotypes," each of which involves some aspect of imitation. One possibility is that the child discovers "stereotypes" or schemata in his chance scribbles. Later, more complex schemata are discovered in random or less controlled aspects of already mastered schemata. The second is that the child bases "stereotypes" on perceptual sensations; in other words, the child attempts to produce a graphic equivalent of what has been perceived in the phenomenal world. Willats claims that both of these assumptions are present in Luquet's theory (pp. 14-15). The third possibility, according to Willats, is that they are learned either by "association from the pictorial environment" — copying from other pictures — or as the result of explicit teaching," "let me show you how to draw a cube" (p. 15). Gardner (1980), too, argues that

graphic models play a role in development. He states in his chapter "To Copy or Not,"

> We have seen that for individuals in our society the achievement of accurate representational skills is at a premium during the years of schooling. Copying presents itself as an obvious means for attaining such skill, and we can expect youngsters to gravitate toward it with or without support from others in their society (p. 191).

Perhaps even the strongest case that might currently be made to support evidence of the early age at which the influence factors emerge, the extent and the power with which they exert themselves is in our paper on the two-eyed profile (Wilson and Wilson, 1980).

In the figures in the up-and-down-the-hill drawings, however, the precise nature of the influence principle is more difficult to discern than when one detects an instance of rather direct modeling. Obviously, present day influences may be seen in the general style of the drawings, e.g., there were no two-eyed profiles. But does the influence principle manifest itself in any other way? We think that any move to orient figures to the vertical is the result of the influence principle. Here is our argument. If the desire to use the most simple configuration possible while still achieving a graphic goal is among the most basic innate factors (Arnheim, 1974, pp. 174-182) then any movement away from the simplest configuration used to present an object is, we think, the result of the influence principle. In other words, when a three-year-old child draws an unadorned circle and proclaims it to be a person, we might assume that we are observing the most basic instance of the child's "satisfactory" symbolic presentation of a person. If subsequently, the child looks at an actual person or at a drawing of a person by another, notices two eyes and then thinks "oh, my person needs eyes, too," then the influence factor has come into play. Of course the "simplicity-principle" is still in effect, i.e., the person does not yet have a body, arms or legs. When they do appear it will be a result of the influence factor. In the same way, an invisible "influence cable" pulls the up-and-down-the-hill figures toward a vertical orientation.

And now in respect to the influence principle, what might we be able to claim about the figures with the bent legs — the feature that we assume to be most highly related to the influence principle so far as the orientation of the figure toward the vertical is concerned? (We are, of course, observing one influence factor, bent legs, being employed to achieve another influence factor, a depiction of the effect of gravity on figures.) It is obviously not possible from the data to conclude whether or not the "bent" feature resulted from direct observation of people walking or from memories of other graphic models of figures with bent knees.

We have written extensively about the fact that graphic images appear to be more influential than perceptions of the phenomenal world in providing models for drawings (Wilson and Wilson, 1977, 1979). The reasoning behind our conclusion is this: graphic images are much more like other graphic images than they are like objects in the phenomenal world. Thus the inventing of a graphic equivalent for an actual object may be more time-consuming and more difficult than merely borrowing directly from another static, simplified, schematic graphic image. This borrowing may occasionally result from direct copying or as is more frequently the case, may be based on a memory of a previously experienced graphic image. In other words, graphic images seem easier to remember than phenomenal world perceptions.

We think that a further resolution of the nature of the interplay between the phenomenal perception and graphic model aspects of the influence factor are essential to the understanding of

graphic development. Furthermore, we think that experiments can be designed that will reveal the relative effect of graphic models such as those on (1) direct phenomenal-perceptual observations, (2) memories of phenomenal perceptions, (3) memories of graphic perceptions, (4) direct graphic rule teaching and (5) teaching based on kinetic perceptions of one's own body.

Interactions of the Innate and the Influence Principle

Each up-and-down-the-hill figure contained manifestations of both the influence and the innate principles. Sometimes these principles functioned in unison to achieve particular graphic ends — legs were lengthened to fill space created by a vertically oriented figure. At other times, even when bent legs contained a high degree of differentiation, the invisible power of the innate principle still pulled figures into the tension and occasionally into the perpendicular orientation regions. Similarly, the producers of figures with influence-derived bent legs avoided overlap of either hill or figure by placing figures on top of the hill baseline rather than in the hill plane. Just as the drawings of the oldest subjects contained numerous innate mainfestations, the drawings of the youngest subjects contained influence factors, but these influence factors affected the configurations or shapes of the figures far more than they affected the manner in which the figures were oriented to the hill. Among the oldest subjects the innate factors still persisted although sometimes weakened in their governing power. In no way could it be claimed that one principle was the exclusive possession of a particular age group.

Lest there be a misunderstanding that we ascribe more value to one principle than the other — that the manifestations of the influence principle are more highly prized than the innate, or that those of the innate are of a lower order — may we now state that this is not the case. Among the most powerful graphic statements, for example, were drawings of figures with straight legs, although they might not give the precise appearance of walking up a hill. It is only in relation to personal and graphic goals that the question of which is the more desirable or preferable governing principle may be answered.

In a culture such as ours that prizes a high degree of graphic visual realism (Gardner, 1980, p. 191), the continued primary reliance of individuals on innate factors for ordering spatial relationships in drawings arrests graphic development far short of the implicit cultural graphic goals, or in fact short of an individual graphic goal. Remember that Miss "E" was dissatisfied with her cows coming down the hill at such "odd angles." Graphic development, we think, is essentially a matter of learning to override with influence factors those innate factors that conflict with current cultural graphic norms and personal graphic desires. Without at least some overriding of the innate, development simply does not occur. There is no culture in which the innate and the influence are isomorphic; and, of course, we must also consider the situations such as children's use of the two-eyed profile (Wilson and Wilson, 1980) in which there was a widespread modeling from what is now a rarely occurring spontaneous innate manifestation. In other words, innate features are as readily modeled as predominanty cultural ones.

We think that the innate principles remain for a lifetime, and they have a continued potential to affect graphic production although, in some cases, they are almost entirely overridden. Artists, for example, who have fully assimilated linear perspective and foreshortening conventions in their drawings and paintings, might still

manifest the effects of innate principles in areas that are not as fully conventionalized, such as pictorial composition. (If we look carefully we might see these innate manifestations in Rembrandt just as readily as we see influence manifestations in the drawings of young children.) Attention to the interactions between the innate and influence factors and the interactions among individual innate and influence principles affords a totally new means of theorizing about graphic development. This new theoretical position would free us from the severe limitations of the age-based-innate-factor-only formulations that are neither able to account for an autistic 3½-year-old girl's being able to draw like a skilled adult (Selfe, 1977) nor for the normal elderly woman who draws like a child of three (Wilson and Wilson, 1977, p. 7). A new interactionist theory would even provide explanations for why a single drawing sometimes contains characteristics from three or four of, say, Lowenfeld's developmental stages.

We think that further attempts at viewing graphic development as children's acquisition of increasingly more complex and powerful innate rules that depend only on discoveries from the phenomenal world or from inventions, but not from modeling-after will yield inadequate one-sided explanations. Adequate theorizing involves accounting for and integrating all relevant variables.

Proceeding on the premise that graphic configurations result from interactions between the spatial/ordering *innate* principle and the stylistic/contour *influence* principle, we pose the following hypotheses: (1) When a series of innate factors interact with one another in a given graphic task, the governing power of the innate principle will be the strongest; (2) when, in an individual's graphic configuration, an innate factor governs one or more aspects, the innate factor will continue to govern until overridden by an influence factor relating to the same aspect or aspects; (3) when one or more innate factors supersede another innate factor, there is less necessity to employ influence factors to override the innate factors; (4) the influence factors most easily acquired are those that do not interfere or conflict with innate ordering principles; (5) innate-like features are just as readily modeled as more purely influence-related features.

We have attempted to characterize graphic development as a process in which, at any one point, a number of factors might come into play, as opposed to the traditional view that it is simply an organic process. In order to effect a single graphic configuration, it is possible to suppose the interplay of a complex series of innate factors interacting among themselves, as well as a group of influence variables interacting both among themselves and in tandem with or in tension to the innate factors. Often, the results of such a marriage are curious and amusing; but curious and amusing as were Miss "E's" cows and our up-and-down-the-hill figures, they nonetheless point to a new way to theorize about drawing development.

References

Arnheim, R. *Art and visual perception: a psychology of the creative eye, the new version.* Berkeley & Los Angeles: University of California Press, 1974.

Day, M. Child art, school art and the real world of art. In M. Dobbs (Ed.) *Art education and back to basics.* Reston, Va.: National Art Education Association, 1979.

Freeman, N. H. How young children try to plan drawings. In G. Butterworth (Ed.) *The child's representation of the world.* New York: Plenum Press, 1977.

Freeman, N. H. and Janikoun, R. Intellectual realism in children's drawings of a familiar object with distinctive features. *Child Development,* 1972, **43,** 1116-1121.

Gardner, H. *Artful scribbles: the significance of children's drawings.* N.Y.: Basic Books, Inc., Publishers, 1980.

Goodnow, J. *Children drawing.* Cambridge, Mass.: Harvard University Press, 1977.

Luquet, G. H. *Les dessin enfantin.* Paris: Alcan, 1927.

Lowenfeld, V. *Creative and mental growth,* 3rd Ed. New York: The Macmillan Company, 1963.

Piaget, J. and Inhelder, B. *The child's conception of space* (Trans. F. J. Langdon and J. L. Lunzer) London: Routledge and Kegan Paul, 1956.

Selfe, L. *Nadia: a case of extraordinary drawing ability in an autistic child.* New York: Academic Press, 1977.

Schaefer-Simmern, H. *The unfolding of artistic activity: its basis, processes and implications.* Berkeley and Los Angeles: University of California Press, 1948.

Willats, J. Implicit rules: some of the truth about children's drawings. *Presentations on art education research: perception, cognition and representation I.* Montreal: Concordia University, 1979.

Wilson, B. and Wilson, M. An iconoclastic view of the imagery sources in the drawings of young people. *Art Education,* January 1977, **30,** 5-12.

Wilson, M. and Wilson, B. The case of the disappearing two-eyed profile: or how little children influence the drawings of little children. *Proceeding of National Symposium for Research in Art,* 1980.

Brent Wilson
School of Visual Arts
Pennsylvania State University
University Park, Pennsylvania 16802

Marjorie Wilson
Pennsylvania Furnace,
Pennsylvania 16865

THE CASE OF THE DISAPPEARING TWO-EYED PROFILE: OR HOW LITTLE CHILDREN INFLUENCE THE DRAWINGS OF LITTLE CHILDREN

Marjorie Wilson
Brent Wilson

As I was going up the stair
I saw a man who wasn't there
He wasn't there again today –
I wish, I wish *he'd stay away*
Hughes Mearns

When Hughes Mearns wrote that quatrain, the "man" to whom we devote this paper was more than likely still there; and, although he ceases to exist, we are still apt to encounter him. In each edition of Lowenfeld's *Creative and Mental Growth,* from the first edition, published in 1947, to the sixth, some twenty-eight years later, in 1975, there appears in a child's drawing, the same figure of a "man." His head is clearly turned to present a profile view and yet he possesses two eyes with which he stares at us from the pages of the book (1975, figure 96, p. 201). We smile at the image but dismiss it as yet another instance of the drawing child's seeming insistence on presenting "all" that is known of an object — the same phenomenon that produces, simultaneously, interior and exterior views of a house or both legs of a rider astride a horse seen in profile. And didn't Picasso, as well, present us with the paradigmatic model for the two-eyed profile?

The young "artist" was identified by Lowenfeld (1939) as D.H., one of the "weak-sighted children" with whom he had worked in Vienna. Subsequent information in *The Nature of Creative Activity* tells us that the drawings were made in 1936 when D.H. was eleven years old. Lowenfeld accounts for the appearance of the figure by noting that ". . . as characteristic in the representation of the face that it develops from the frontal drawing, with dots for eyes, a vertical line for nose, a horizontal one for mouth, via a mixed form containing the nose at the side, to the profile proper" (p. 27). He attributed the "mixed front view and profile" including "both eyes and the nose" to the fact that all were of equal significance to the child (1947, p. 43). By 1975, Brittain has modified a good deal of the Lowenfeld text; yet he not only retains D.H.'s two-eyed profile, but he continues to account for the appearance of the mixed view "that includes a representation of two eyes and a profile nose" (p. 187) as though it continued to exist; but how many of us who are regularly confronted with drawings produced by children have seen the two-eyed profile in the course of the past forty-five years or so? Who or what is this spectral man? We know that he once existed, and that he existed in a multitude of forms. In the same way that the early global and tadpole configurations cover a wide spectrum, the many manifestations of the two-eyed profile range from the merest near-global representation to a well-developed model, complete with body, arms and legs.

In "true anthropological" manner we have shown that the two-eyed profile once inhabited the earth. Because of the dearth of information regarding the drawings of children before the late 19th century, however, we have been unable to trace the beginnings of this phenomenon, although research

Additional unpublished graphic materials supporting this research are available from the editorial office of the Review of Research in Visual Arts Education.

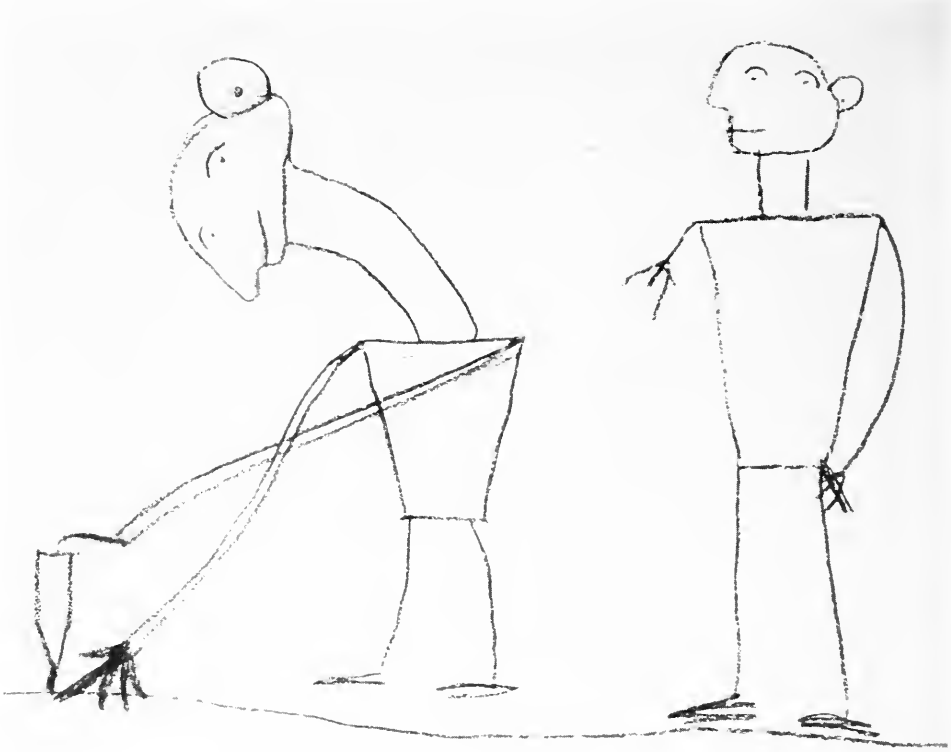


Figure 1. "Searching for the lost pencil" D.H., age 11. Collected by Lowenfeld, 1936, Vienna. Collection of The Pennsylvania State University.

attests to a profusion of these specimens as early as 1882.

The recorded history begins with a study by the Italian Corrado Ricci, dated 1887. Ricci has recounted the story of his serendipitous discovery of children's drawings on a portico wall in 1882, and the way in which he was inspired to make a study of the drawings of young children. About the early figure drawings, he states that "before a man can become entire he must pass through many stages, and they are not prompted to jump at once from this primitive form to complete physical integrity." The stages to which Ricci refers include the sideways movement of the figure from front-view to profile following "the little one's own laws," described in this way:

> A man should stand as it pleases him, in profile or full face, and there is no reason for curtailing him; seen from just one side or the other, he will always be a man with two arms and two eyes.

Ricci found, in a study of 1250 drawings that when children drew the profile, seventy times out of a hundred, they continued to include the two eyes of the full face.

Five years later, in 1892, Earl Barnes, who had also conducted a study of children's drawings, found that Ricci's earlier study had reached conclusions very like his own. Barnes, too, noted the two-eyed profile to be "the general law." He collated 12,740 faces from pictures drawn by children from six to thirteen years old. He found that

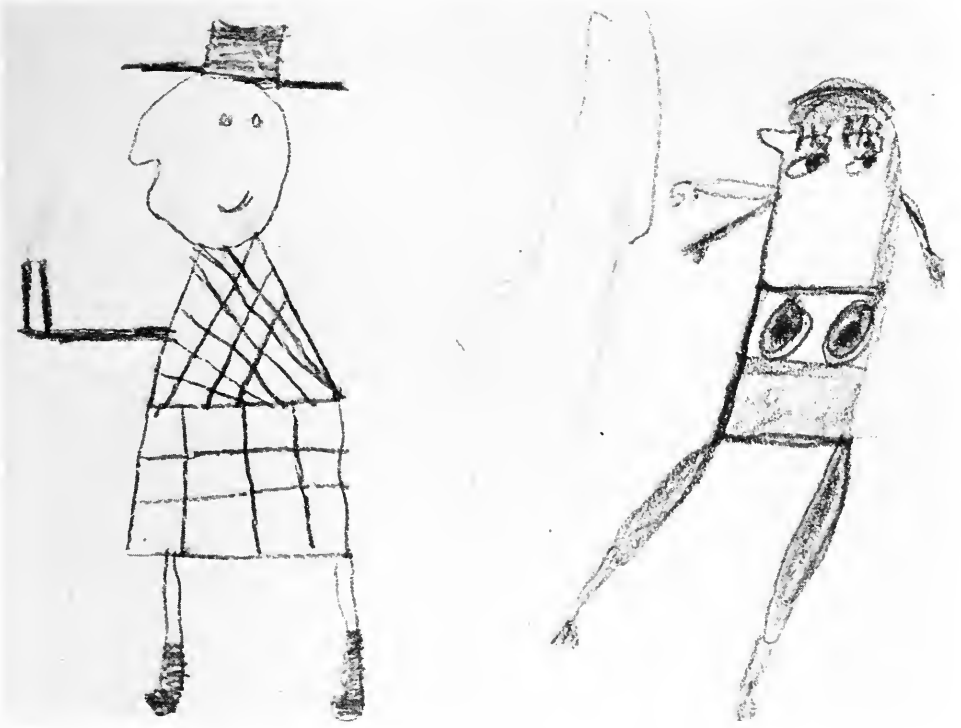


Figure 2. Collected by Thorndike, circa. 1913, U.S.A.

"At six years, twice as many full-faces were drawn as profiles. From six to thirteen, full-faces decreased, and profiles increased, and, at thirteen, there were twice as many profiles as full-faces. The number drawn of each was equal to a point between nine and ten years old."

In 1902, Lena Partridge studied the human figure in the drawings of English children. Partridge's study is one of the most rigorous, replete with numerous tables and figures through which she was able to chart the development of the human figure. She observed, as had Ricci and Barnes, that the full-face man is gradually turned into a profile man as the child grows older. She made the additional observation that, as the child advances in age, there is a tendency to "turn certain limbs and features to the right" during the stage occurring between the representation of the full-face figure and the profile, a treatment she described as "mixed." The pecentages in her chart for the "mixed treatment of heads" reveal that "until eight years of age, more than half the attempts at profile are really drawn in this confused manner." At the age of eight the percentage of two-eyed profiles was calculated to be 30%. Partridge made a supplementary study in which she determined that the presence of a model and the position in which the children saw that model had little influence on the drawings of children under the age of eleven. Of the hundred girls in the study, 23 drew . . . the mixed view, "a strange form," she notes, "that could not have been seen from any point of view."

Meanwhile, studies in other countries substantiated not only the existence of the two-eyed profile but the great proliferation of these curious creatures — not unlike the insidious

Figure 3. Collected by Kerschensteiner, circa. 1905, Germany.

Schmoo (a creation of Al Capp that bred in great multitudes) — whose amorphous shape they sometimes assume.

Of the 67 drawings mainly by five- and six-year-old English children used to illustrate the chapter in his book dealing with children as "draughtsmen," Sully (1903) showed 36 two-eyed profiles. It seems to be no accident that a full 54% of the characters that he presents are of this type. Of them he notes:

> The first clear indication of an attempt to give the profile aspect of the face is the introduction of the angular line of the side-view of the nose into the contour. The little observer is soon impressed by the characteristic well-marked outline of the nose in profile; and as he cannot make much of the front view of the organ, he naturally begins at an early stage, certainly by the fifth year, to vary the scheme of the lunar circle, broken at most by the ears, by a projection answering to a profile nose.

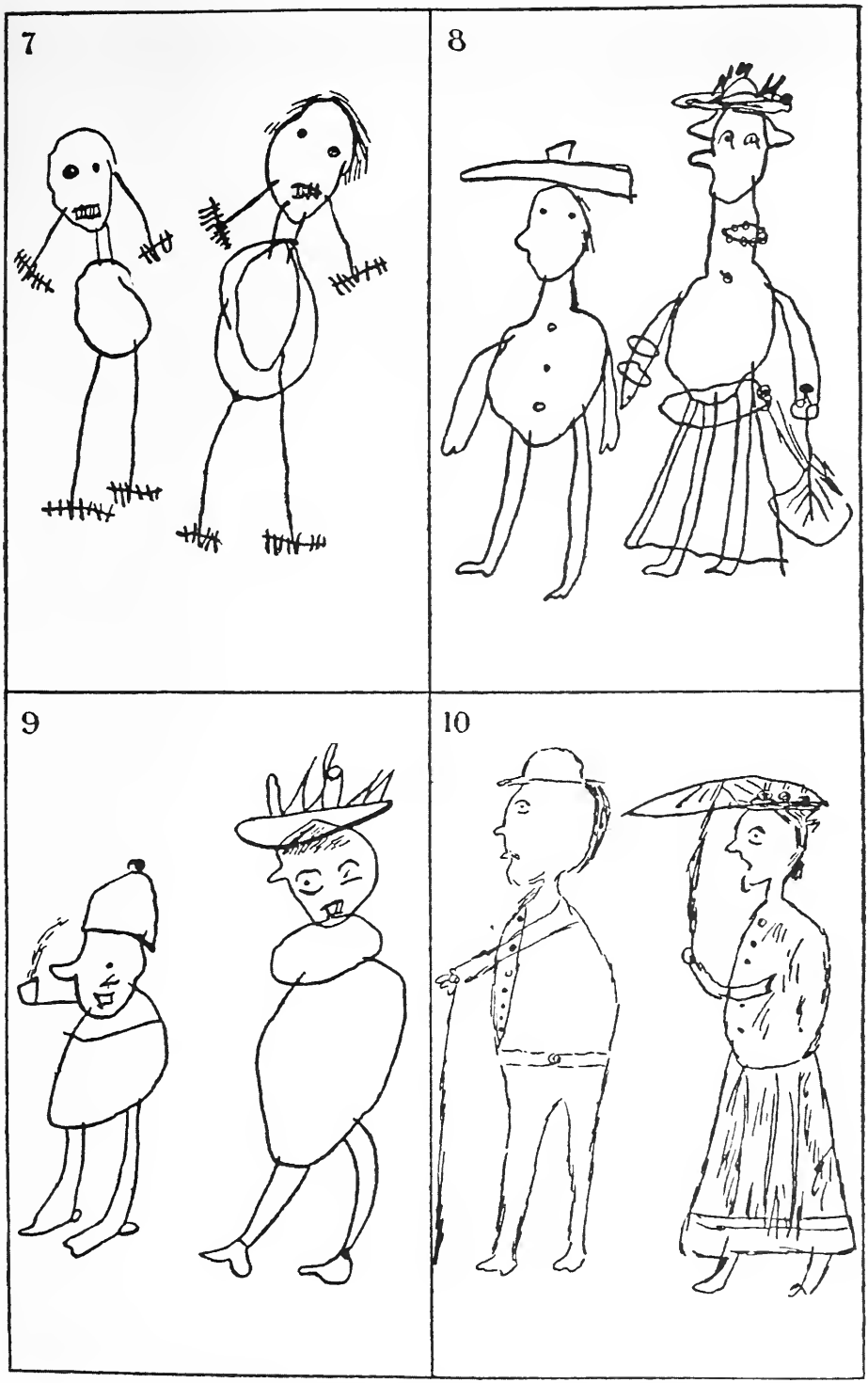


Figure 4. Gradual turning of the figure to the right, Partridge, circa. 1902, England.

and again describes:

> the mixed scheme, in which the eyes and mouth retain their front-view aspect (p. 357).

In Germany in 1905, Levinstein reported,

> Young children usually draw the face in a full front view, but at the age of four, 4 percent of them introduce some profile, some heads being drawn with some features, especially the nose, both in profile and in front. At seven, 34 percent show transition stages.

In the same year, working in Munich, Kerschensteiner presented his own study including some of the most idiosyncratic two-eyed profiles we have found, as the common representation of a man (1905).

In Belgium, Rouma (1912) sought to trace the evolution of the representation of the man in children's drawings, and to compare his own findings with those presented by Lena Partridge. In this extensive study, Rouma described in detail the diverse aspects observed in the development of the human figure in individual drawings. "Le Profil de Transition," in which the drawings appear part full-face and part profile, is designated as a stage in that development. The sixteen figures and heads appearing under this caption include figures with two noses — one profile, one front-view, as well as a profile head with two eyes, one atop the other (pp. 50, 51). To the various explanations for the existence of the two-eyed profile — that it is the characteristic view (Lark-Horovitz et al.); that the child cannot draw the front-view nose (Sully); that the child has a natural tendency to turn the figure (Partridge) — Rouma hypothesized that it was the prominence of the nose itself that was fascinating to the child, a feature he had seen exploited in their humorous drawings. Rouma's detailed descriptions also revealed another significant detail; before the child includes the nose as a protrusion in the contour of the face, he noted that the nose is attached to the left side, drawn either as a small circle or as two lines at an acute angle, just as we observed in some of Sully's specimens.

Luquet's familiar work categorizes the stages of development in children's drawing to include at age six and seven what he called *intellectual realism.* Among the characteristics of this stage, Luquet numbered what he noted as a contradiction or as a change in point of view included in the same drawing — a feature translatable to the two-eyed profile — and leaving no doubt of that fact when he suggests that an indicator of the transition to the stage beyond may be the child's restriction to including only one eye in a profile contour.

The two-eyed profile appears, also, as step .3½a on the 1923 revision of Thorndike's 1913 *Scale for General Merit of Children's Drawings.*

It becomes obvious, then, from this mounting body of evidence, that the two-eyed profile appeared, to these early researchers, to have been an innate phenomenon. Indeed, it would seem that, along with the ubiquitous scribble and tadpole person, the child is applying a universal innate principle of graphic development. The data in studies such as Ricci's and Barnes' and Partridge's show a pervasive frequency of the two-eyed profile; and the careful charting of the development of a schema for "man" shows the systematic sideways movement of the figure — even, as documented by Partridge, to the right — a regularity that persisted through Lowenfeld's Vienna studies well into the thirties. But where is the two-eyed profile today, and where, in fact, is its matured counterpart, the profile proper?

We begin to note the decline and fall of the two-eyed profile in Table 1.

Table 1 illustrates the surprisingly high incidence of profiles and two-eyed profiles in Western Europe, England and the United States between the years 1883 and 1905, the sharp de-

TABLE 1

The Decline of the Two-Eyed Profile*

Source & Country	Year	Age	% Profile	% Two-Eyed Profile
Ricci; Italy	c1883-86	6-8		70**
Barnes; U.S.	1892	9	50	
Sully; England	c1895	5-7	85	54
Partridge; England	c1902	8	76	30
Levinstein; Germany	c1905	7		34
Goodenough; U.S.	c1923	7.5 to 9.5	48	5
Harris; U.S.	1953	8	28	0

* These data are interpolations, drawn from the researchers various ways of sampling and reporting. The chart provides general trends but should not be used for precise comparisons. The Goodenough and the Harris data are more accurate; they were tabulated by the authors from national standardization samples of figure drawings from the Goodenough and Harris Draw-A-Man Tests.

** 70% of all profile heads were reported to have two eyes forward.

cline in the United States by 1923, and the complete disappearance of the two-eyed profile by 1953. It is reasonable to assume that the disappearance probably occurred in the United States some time *before* 1953; it is also possible that the sharp decline may not have occurred as early in the European countries as in the United States. We have not located data to provide evidence of this, one way or the other.

We should note, as well, that the incidence of the representation of the profile itself appears to be diminishing along with its two-eyed counterpart from 85% in 1895 steadily down to a mere 28% in 1953.

The two-eyed profile seems to have completely disappeared, and yet, is it not curious that, in spite of these facts, in Brittain's 1975 distillation of Lowenfeld, D.H.'s anachronistic man persists in his search for his pencil? Similarly, in 1973, Lark-Horovitz, Lewis and Luca assume the continued existence of the two-eyed profile. Returning to Ricci's 1887 study, they maintain that "the schema of the human face, and its development, has a logic of structure and growth which is as clear in drawings from the last century as in those of the present time, and in this part of the world as in another" (pp. 50, 51). We say that this is simply not so, and in spite of assertions to the contrary, we fail to find, either in the Lowenfeld/Brittain illustrations or in those of Lark-Horovitz et al. another incidence of the two-eyed profile. We might add that in our recent examination of thousands of children's figure drawings from Jordan, Egypt, Australia and New Guinea, we have not found a single two-eyed profile; and despite Kellogg's (1969) meticulous analysis, classification and cataloguing of every particular in the drawings of young children, our examination of 8000 or so of these drawings on microfiche failed to reveal a trace of our evanescent friend.

In Claire Golomb's (1974) study of the drawing and modeling in pla-do of three hundred children between the ages of two and seven in the United States and Israel, the profile is given only passing mention. She states that there is some consideration given by

the children to the drawing of profiles (p. 119), but if the profile was attempted by any of the subjects it seems not to have merited illustration. Goodnow includes some profile figures in *Children Drawing* (1977), but they generally appear as the running figures of older children, which action is easier depicted in a profile view. The turning of the body sideways, however, is noted by Goodnow as either a variation or a small change in a "formula," but nowhere in this recent work is there a two-eyed profile to be seen. "The little man who wasn't there" is simply *not there!*

We have come to the important question: What is the meaning of this mysterious disappearance? If the child had, indeed, been following innate rules, how could the two-eyed profile have gone away?

If innate rules become altered, modified or dissipated over time, why is it that some seem to have done so and others to have persisted?

Does the disintegration of this factual thread in the carefully constructed fabric of belief about the child's graphic development mean that the entire cloth is likely to unravel?

If the explanation given for the existence of the two-eyed profile by Lark-Horovitz et al. (1973) — that the profile nose as well as the frontal eyes are drawn by the child because it is the most characteristic view — is taken as true, why is it that the child no longer includes, in the general repertoire of her developing graphic schema, the profile with either one or two eyes?

If, as Lowenfeld claimed, the child includes both the profile nose and frontal eyes because all are of equal significance to the child, could they have now become less significant?

If, as Partridge theorized, children have a natural tendency to turn the figure sideways, why now has it become (according to Goodnow) merely a "variation" in a "formula"?

If, as Sully supposed, the child draws the profile nose because of the difficulty of drawing the nose front-view, has the child become more proficient or the task less difficult?

If, on the other hand, the two-eyed profile could be interpreted as a random spontaneous occurrence, how does this explain the high percentages of occurrence in 1887 and would not the two-eyed profile occur today in drawings of humans with some frequency?

All of this leads us to two further questions: Of what, then, was the two-eyed profile a result? Where did it come from and why has it disappeared?

The coming and going of the two-eyed profile would seem to have some profound implications for theories of graphic development.

The first conclusion we must come to is that the two-eyed profile is not merely an innate factor, as Barnes and the rest would have it. If, as we have shown, the two-eyed profile existed in such astounding numbers in Western Europe, England and the United States in the late 19th and early 20th centuries, and it has now disappeared, then we must conclude that we are seeing the result of some factor other than the innate — an influence factor that was operative at first and later ceased to function.

It is important at this point to speculate about what the conditions for the proliferation, the subsequent minimization and eventual demise of the two-eyed profile might have been.

As we have already noted, the data that might have disclosed the beginnings of the two-eyed profile have been buried in the past. Although we do not know of its precise origins, there are a few possibilities worth noting:

The contradictions referred to by Luquet as "rabattement" which appear in the stage of *intellectual realism* in the child's graphic development, do, in fact, occur spontaneously in the

drawings of children in the form of aerial views, transparencies and other such phenomena. We see, too, the depiction of a cart or vehicle in a splayed view, displaying four wheels, two on top and two on the bottom, as related to the two-eyed profile; while the two-eyed profile, itself, appears frequently in the child's depiction of fish and animals that are traditionally shown in a profile view. One such depiction appears among Heidi's many renditions of a horse (Fein, 1976, p. 29). In addition, although appearing infrequently as does the two-eyed profile as we have described it, the mixed profile of today, e.g., head and body front; legs profile, is a similar manifestation. (Even these anomalies however, show some evidence of becoming less frequent in the drawings of media-influenced boys.)

What may we infer from these spontaneous occurrences? Earlier we advanced the question that, if the two-eyed profile could be interpreted as a random spontaneous occurrence, then how might we account for the high incidence of two-eyed profiles in 1887 and for the absence of occurrence in drawings of humans at the present time. Here we will attempt to answer that question.

Wilson and Wilson have earlier (1977) made the assertion that the drawings of children are affected by influences of the culture, of objects in the phenomenal world (1980) but primarily and most importantly that the drawings of children are influenced by the drawings of children. Given the fact of the spontaneous occurrence of the two-eyed profile, might we not assume that the two-eyed profile that was so prevalent in the early part of the century was a result of a spontaneously occurring phenomenon, appearing in the work of some children, that was passed on to other children? Even so, could such an influence alone account for the extensive appearance of the two-eyed profile in Western Europe, England and the United States? Certainly inquiry into the functioning of the spontaneous occurrence of the two-eyed profile in the drawings of some children today would reveal little or not influence on the drawings of other children. In fact, given no reinforcement and in the presence of a multitude of options, these oddities seem simply to remain with the originator, who plays with them for awhile and then moves on to other images. But this was surely not always the case; even such insidious imports as the Japanese beetle and the Russian flu would cease to flourish if the fertile conditions for their survival did not prevail. Let us, then, speculate as to what the fertile conditions for the proliferation of the two-eyed profile might have been. Before we do, however, we would like to contemplate one aspect of the suggestibility or model-ability of certain images. How, for example, it happens that we see certain motifs repeated over and over again as we study children's drawings, e.g., the rectangular house with triangular roof and perpendicularly-oriented chimney, with or without curling smoke. We do not consider the appearance of the house and other such configurations to signal a separate stage in the child's innate graphic development, as the appearance of the two-eyed profile was thought to do, and yet, both images would seem to have been innately derived, that is, derived through the application of innate rules. We will show in another paper, however (Wilson and Wilson, 1980), the persistence of principles that are known to be innate even in the presence of factors that strongly influence images otherwise, as found in the drawings of children and adults alike. It is the interplay of the innate and the influence factors that we believe to have been operating in the enduring life of the two-eyed profile and that those things that are closest to the innate, such as the spontaneously-occurring two-eyed profile are

most readily, easily and naturally modeled from one child to another. In conjunction with the essential predisposition of the two-eyed profile to be modeled, then, we need to examine the circumstances that might account for the escalation of the two-eyed profile to the position of so powerful and dominant a model.

First we need to consider the state of children's art about 100 years ago:

The concept of *child art* is one of our own making, an invention that occurred at the end of the 19th century. Before that time child art as we know it did not exist. There would have been little drawing and little encouragement to draw in the home. The drawing done in schools was described as highly structured: the thought of that day was that "the material best suited for originating art instincts consists of the dislocated parts of conventional designs and the typical geometrical forms . . ." (Burk, 1902, p. 323). Spontaneous drawing was surely not fostered, but Ricci himself supplied evidence of its presence in 1882. His discovery of the drawings of children on a remote portico wall bespoke a sort of 19th century graffiti, described, in the case of the older children, as "hardly what could be considered chaste . . . inspired by an extremely crude realism" and leaving little doubt that spontaneous drawing did exist. We might note, also, that Franz Cizek, the so-called father of *child art,* was observing at almost the same time — Vienna in 1885 — young boys making drawings with chalk on a wooden fence, at times even fighting over the ownership of the space (Viola, 1936, p. 12) — the now famous incident that led to his discovery of child art. In search of truly spontaneous drawings, Luquet, in fact, made copies of children's drawings he had found on walls in disparate locations in France in the early part of the century, drawings that he labelled graffiti, and giving some hint of the prevalence of the pre-twentieth century practice of drawing on walls. And what did children draw on walls and elsewhere? Luquet shows the human figure. The studies of Ricci and Barnes, of Sully and Rouma and the rest attest to the fact that the figure played a large part in the early drawings of children. An 1895 (Maitland, cited in Burk, 1902) study shows a marked preference by children, when drawing "to please themselves," for drawing the human figure over animals, plants and houses. The decline in interest in drawing the human figure and the preference for still life and geometric design after the age of eleven demonstrated in those same tables, indicates what we know to be the case — that "after the age of eight or nine, it seems that the difficulty of representing begins to be really appreciated and there is less confidence and satisfaction in the work" (report to N.E.A., O'Shea, 1894). Where, then, could children learn to satisfactorily represent the human figure? To whom did they turn? We might assume a situation of this kind:

We have all been told of the scarcity of paper in the early part of the century. With this commodity in such short supply there was certainly not the opportunity for the child to spend innumerable hours engaged in the practice and perfection of imperfect schemata that we are able to witness with the cheap and abundant resources available today in the form of notebook paper, long computer print-out sheets and even, as Gardner describes, galley proofs (1980, p. 100). And even if such paper had been available for these pursuits, there would have been few models. We can assume that adults were exerting little or no influence on children's drawings; furthermore, media models in the way of periodicals, picture books or Sunday comics were meager. Kerschensteiner's study provides us with some interesting data in this regard. In addition to other facts that he felt to be of some signifi-

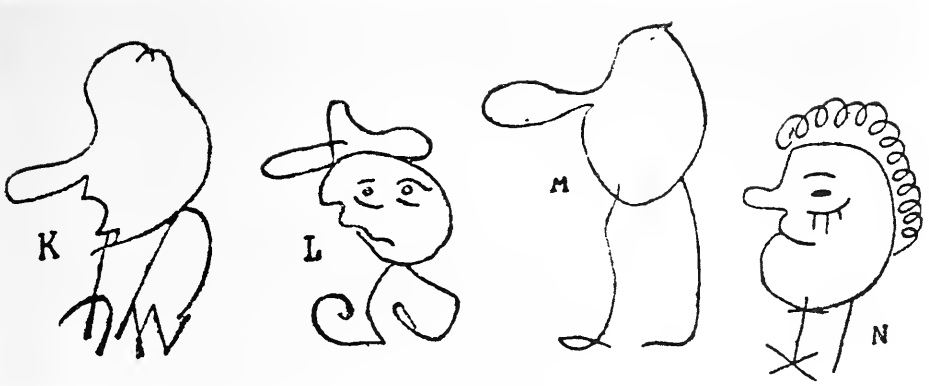


Figure 5. Luquet's drawings of figures found on walls. Early twentieth century, France.

cance such as sex, age, and school grade of each of his subjects, Kerschensteiner carefully made note of whether or not the child had *bilderbuch* or picture books in the home. We have been led to wonder whether, by presenting this information as he did, he might have been, consciously or unconsciously, reflecting a view of the way in which picture books may have influenced children's drawing. An examination of these data shows that 70% of the children who drew two-eyed profiles had no picture books, while only 34% of the others were reported to have been without picture-books.

Faced with the paucity of adult models, the children drawing on walls and fences would have found their models in the drawings with which they were most familiar and which were available to them. Ricci described his portico wall as displaying the drawings of the older children in a higher position while the works of the "youngest artists" appeared "lowest down on the wall." We may assume that the younger children modeled their drawings on those higher up on the wall, those of the older children. Cizek's Austrian Tom Sawyers, too, would have included older and younger children drawing together on the fence. We find that in some of our research with the graphic dialogue, when adults draw on the same page with children as well as when children draw with other children, there is a good deal of emulating taking place, so much so, that, at times, it becomes difficult to separate one set of drawings from another. Children, then, would appear to have been mainly influenced by other children, the younger by the older, the older by their peers, leading to greater and greater degrees of homogeneity until the drawings would have become highly homogeneous, this homogeneity bringing about the proliferation of such spontaneously-occurring images as the two-eyed profile.

If this explanation does, indeed, account for the appearance of the two-eyed profile, then how can we account for the fact that, by the 1920's its appearance had diminished until it has now totally disappeared? *Where has it gone?* We need to note one other important fact. Each of the researchers we have mentioned had concluded, as had Dale Harris (1963) much later in the century, that the two-eyed profile preceded and was the result of a failed attempt to draw — the profile. Therefore, the profile proper appears to have exerted a great deal of influence and to have been modeled by the child as the most characteristic view — from

other art sources? from popular 19th century media? we do not know for sure — but surely the greater the incidence of the profile, the greater the incidence of the two-eyed profile.

If, then, the original problem that we set for ourselves, *What caused the mysterious disappearance of the two-eyed profile?* can be answered by presuming that the disappearance of the two-eyed profile coincided with the disappearance (or at least the decline) (Table 1) of the profile, then we need to ask, as well, *What ever happened to the profile?* Assuming, as we have, that cultural conditions — the lack of opportunity and encouragement to make spontaneous drawings, the rigid art lessons taught in schools, the lack of easily available materials and the proliferation of profile models — led to the birth of the two-eyed profile, then, surely cultural conditions would have led to its demise as well. A first step would be to chronicle the decline of the profile model as the most characteristic view. If, in the 1840's, *Godey's Ladies* stood alone, clad decorously in their lavish bonnets, gazing primly only to the right or very nearly so, the end of the century and the advent of new printing technology supplied them with a good deal of company. With the rise of illustration in the popular media, and following in the tradition of *Charivari,* founded in Paris in 1838; *Punch,* in London in 1841; *Le Rire* in Paris and *The Yellow Book* in London in 1894; *Simplicissimus* in Germany, each featuring cartoons by such notables as Daumier, John Tenniel, Toulouse-Lautrec, Aubrey Beardsley, Rowlandson and George Grosz, the early 1900's in America saw the appearance of the daily comic strip (Robinson, 1974).

Not unlike the child of today, who, Hulk-like, flexes his muscles, makes growling noises and dreams of making off with his mother's green food coloring, and the Superman-inspired child of the 40's who, arrayed with nothing but *chutzpah* and a bedsheet for a cape, made more than one calamatous jump from the roof, the child of 1903 and 1904 was presented with all manner of models to emulate. And the first and most popular strips featured kids, outrageous kids — *The Yellow Kid, The Katzenjammer Kids, Buster Brown* and *Little Nemo* — a glorious pastiche of fantasy and pranks and nonsense to capture any child's fancy and to satisfy his wildest dreams. The forerunner of the movie cartoon, these kids were always in a state of animation; they ran, jumped, swam, flew and somersaulted daily through their various adventures, and one could not say of them, as of earlier static illustrations, that there was one characteristic view. Like the compelling image of the two-eyed profile before him, the cartoon kid appealed to the graphic spirit of the child. He was presented with clarity, simplicity and charm; he was humorous and outrageous and appealing, and many were not terribly far removed from the graphic forms of which the child was already capable. Today we have in this genre Snoopy and Charlie Brown. Kids love them; they are easy to reproduce even by those with limited means, and although art teachers abhor them, there is no question that they are infinitely modelable — as was *Henry* and *Popeye* and *The Yellow Kid.*

What is truly amazing is the absolute power of images such as these. It would seem to us that if anything is to be learned from the meteoric rise and fall of the two-eyed profile, it is that, in order to realize an adequate theory of graphic development, we will need to pay attention to both of the factors that appear to be operating in that sphere — the innate and the influence. How do these two factors function in the developmental scheme vis-à-vis the two-eyed profile? We will offer these three hypotheses: 1) When adult influence is less extensive, then child influence will be greater. These child influences, which are highly depen-

dent on the innate factor, are generally narrower. 2) When the child influence is greatest, options are fewest; thus there is the greatest homogeneity of figures in drawings. 3) When adult influence is greater, more options result from the number of models available, leading to greater variability in children's drawings — and less modeling of the innately derived images.

What may we conclude from all of this? What does it mean? Why attach any importance to the meteoric rise and fall of so seemingly insignificant a figure?

Conclusion

Since Ricci's early discovery of the drawings of children, it has been the popular view that children's drawings are the same throughout the world; all children everywhere initially draw upon the same natural, creative and generative resources for their images. In charting the mysterious disappearance of the two-eyed profile, we hope, once and for all, to have dispensed with the idea that little children are graphic virgins.

The two-eyed profile was perhaps the most striking anomaly to study. However, we could as easily have studied the rise and fall of such features, in the drawings of the children of the late nineteenth and early twentieth centuries, as ladder mouths, the two-cheeked smile mouth, the astonishing range of parentheses eyes, the profile head very nearly filled with one heavily-lashed front-view eye, the crossed arms transparency, the arms from the neck phenomenon, the garden-rake hands, the urn-shaped, milk-bottle-shaped, Christmas-tree-ornament-shaped bodies and on and on. None of these appear today with any more frequency than does the two-eyed profile.

We might speculate that, one hundred years from now, a group of investigators into the origins of children's drawings will smile about green creatures with bulging biceps and caped men who appear to fly through the air; and they will see yet another influence in operation. Even more importantly, at a time when it seems to be acceptable in some quarters to claim that older children are influenced in their quest for graphic realism (Gardner, 1980), we wish to place the influence factor at the very genesis of childhood graphic form — with the four-year-olds and the three-year-olds and perhaps even earlier — to say that any theory of graphic development must surely account for the effects of influence from the beginning. The very appearance of the two-eyed profile in the drawings of the youngest children provides evidence of the early existence of this influence. But in what form do these factors exist, and how do they function in the larger developmental scheme? Let us answer these questions in another paper. . . .

References

Barnes, E. A study on children's drawings. *The Pedagogical Seminary,* 1892, **II,** 455-466.

Burk, F. The genetic versus the logical order in drawing. *The Pedagogical Seminary,* 1902, **9,** 296-323.

Fein, S. *Heidi's horse.* Pleasant Hill, CA: Exelrod Press, 1976.

Gardner, H. *Artful scribbles: the significance of children's drawings.* N.Y.: Basic Books, Inc., Publishers, 1980.

Golomb, C. *Young children's sculpture and drawing: a study in representational development.* Cambridge, Mass.: Harvard University Press, 1974.

Goodnow, J. *Children drawing.* Cambridge, Mass.: Harvard University Press, 1977.

Harris, D. B. *Children's drawings as measures of intellectual maturity.* N.Y.: Harcourt, Brace and World, Inc., 1963.

Kellogg, R. *Analyzing children's art.* Palo Alto, California: Mayfield Publishing Co., 1969.

Kerschensteiner, D. G. *Die entwickelung der zeichnerischen begabung.* Munich: Gerber, 1905.

Lark-Horovitz, B., Lewis, H. and Luca, M. *Understanding children's art for better*

teaching, 2nd Ed. Columbus, Ohio: Charles E. Merrill Books, Inc., 1973.
Levinstein, Von S. *Kinderzeichnunger bis zum 14 lebensjahr.* Leipzig: Voigtlander, 1905.
Lowenfeld, V. *Creative and mental growth.* N.Y.: Macmillan Publishing Co., Inc., 1947.
Lowenfeld, V. *The nature of creative activity.* N.Y.: Harcourt, Brace and World, 1939.
Lowenfeld, V., and Brittain, W. L. *Creative and mental growth,* 6th Ed. N.Y.: Macmillan Publishing Co., Inc., 1975.
Luquet, G. H. *L'Evolution du dessin enfantin.* Bull. Soc. Binet, 1929.
Mearns, H. *Creative power: the education of youth in the creative arts.* 2nd Revised Ed. N.Y.: Dover Publications, Inc., 1958.
O'Shea, M. V. A study of drawings of children in the schools of Winnona, Minn., by children from five to seventeen years. *Proceedings of the National Education Association,* 1894, 1015-1023.
Partridge, L. Children's drawings of men and women. *Studies in Education.* Ed. Earl Barnes, July 1, 1902.
Ricci, C. *L'arte dei bambini.* Bologna: 1887 (Translated by Maitland in Pedagogical Seminary, 1894, **3**).
Robinson, J. *The comics.* N.Y.: G. P. Putnam's Sons, 1974.
Rouma, G. *Le langage graphique de l'enfant.* Bruxelles: Misch et Thron, 1912.
Sully. *Studies of childhood.* (Revised Ed.) New York: D. Appleton, 1903.
Thorndike, E. L. The measurement of achievement in drawing. *Teacher's College Record,* 1913, **14.**
Viola, W. *Child art and Franz Cizek.* Vienna: Austrian Jr. Red Cross, 1936.
Wilson, B. and Wilson, M. An iconoclastic view of the imagery sources in the drawings of young people. *Art Education,* January 1977, **30,** 5-12.
Wilson, B. and Wilson, M. The persistence of the perpendicular principle: why, when and where innate factors determine the nature of drawings. *Proceedings of the National Symposium for Research in Art,* 1980.

Marjorie Wilson
Pennsylvania Furnace,
Pennsylvania 16865

Brent Wilson
School of Visual Arts
Pennsylvania State University
University Park, Pennsylvania 16802

CORRESPONDENCE BETWEEN IMPLIED POINTS OF VIEW AND SELECTED POINTS OF VIEW IN CHILDREN'S DRAWINGS OF FAMILIAR AND UNFAMILIAR OBJECTS

James Victoria
Michigan State University

Introduction to the Study

In this study, a random sample of 64 children in 4 age groups (6, 8, 10 and 12 years) made drawings from one familiar object and two unfamiliar objects. (Appendix A) The children were free to manipulate the objects and to select the viewpoint from which to draw the objects. The position of the viewpoint of the objects was recorded. The viewpoint or direction of implied view in each drawing was compared with the viewpoint from which the subject had selected to view the stimulus objects.

Data was collected in terms of the following categories and classifications:

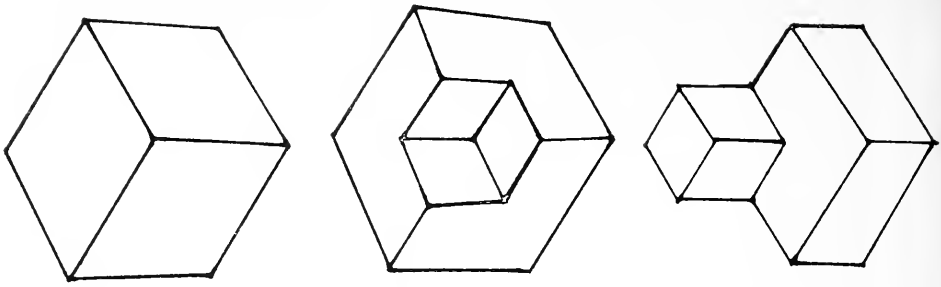
1. Age and Sex
2. Object drawn
3. Developmental stage according to Transformation System evidenced
4. Drawing Class within a Transformation System
5. Selected viewpoint relative to Face or Edge of object
6. Correspondence with viewpoint or direction of view in each drawing with the viewpoint from which the subject had selected to view the stimulus object.

Background of the Study

Willats (1979, 1980) has stated that traditional accounts of the development of drawing ability seem to make drawing dependent upon some type of copying or imitation. This is supposed to take place in two main stages. The imitation of stereotypes by younger children during the period of so-called intellectual realism and, the imitation of appearance of the scene by older children during the period of visual realism. If children in the earlier stages of development of drawing ability have to depend on stereotypes, then we might expect that when asked to draw from an object with which they are unfamiliar, and for which they have no stereotype, they would be unable to make a drawing or would produce the nearest available stereotype.

Willats (1980) found that when children were given both familiar and unfamiliar objects to draw, the younger children were able to draw the unfamiliar objects as freely and easily, at about the same age, and using the same kind of drawing systems, as they were able to draw the familiar ones. This seems to show that young children, although they may sometimes usė stereotypes, do not have to depend on using them. If older children draw by copying the appearance of the scene, then they should be able to draw unfamiliar objects by imitation as easily as familiar ones. Willats found that older children around the ages of 10 or 11 passed through a stage in which they produced drawings which contained "mistakes" — mistakes which are clearly mistakes in the use of drawing "rules" rather than mistakes in imitating the appearance of

Additional unpublished graphic materials supporting this research are available from the editorial office of the Review of Research in Visual Arts Education.



the scene. This seems to show that for older children, as well as for younger children, imitation does not play an important part in the acquisition of drawing ability.

However, if learning to draw depends on acquiring drawing rules, what kind of rule systems are they? The rule systems we are probably most familiar with are those of projective geometry; systems like *perspective,* which map spatial relationships in the scene into spatial relationships in the picture. Besides perspective, there are a variety of other projection systems: *orthographic projection* which is used by architects, engineers and mapmakers, and other systems such as *oblique projection* and its variants, which have been common in other periods and cultures, and which appear in children's drawings. Willats has labled these systems as "transformation systems" because they deal with the transformation of spatial relationships.

Transformation Systems and Drawing Classes

In Willats' studies (1979, 1980) the developmental sequence revealed in these drawings could best be described in terms of three main developmental stages corresponding to the three main types of projective systems: orthographic, horizontal and vertical oblique and the various forms of oblique projection.

In the 1st stage designated by *Class 2 — Single Aspect* drawings, the child is able to use vertical directions on the picture surface to stand for vertical directions in the real scene, and horizontal directions on the picture surface to stand for horizontal directions in the scene. Directions in the third dimension cannot be represented in this system and are simply omitted from the drawing. Thus a cube in this system would be represented by a square.

The next main stage designated by *Class 4 — Horizontal and Vertical Oblique* drawings, directions in the third dimension in the scene are represented by either horizontal or vertical directions on the picture surface. Since these directions already represent horizontal or vertical directions in the scene, one direction across the surface is made to stand for two directions in the scene, and the resulting drawings are often ambiguous. In this system a cube would be represented by two squares, either side by side — *horizontal oblique* — or one above the other — *vertical oblique.*

In the third stage designated by *Class 6 — Oblique* drawings, directions in the third dimension are represented by oblique directions across the picture surface. This resolves the ambiguity in the previous system. Drawings in various other systems — isometric projection and perspective — may be regarded as variants on oblique projection.

The main framework of the developmental sequence could be well described in terms of these transformation systems based on projective geometry; but many of the drawings which preceded those in oblique projections (in terms of mean age of subjects for the class) appeared to contain "mistakes." One way of describing these drawings was to say that they were based on a mixture of different transformation systems; i.e., based on a mixture of isometric projection and horizontal oblique projection. These drawings are designated as *Class 5 — Near Oblique.*

In between drawings in Class 2 (single aspect) and Class 4 (horizontal and vertical oblique) appeared a large number of drawings of a type which have frequently been illustrated in the literature. These drawings are designated as *Class 3 — Multiple Aspect* drawings. Although this class cannot be defined in terms of projective geometry, it lies between two classes which are defined in terms of projective geometry.

Preceding the drawings in Class 2, were drawings which consisted of scribble or closed curved forms. Willats assigned these drawings to *Class 1 — Pre Single Aspect.*

Thus we have a developmental sequence consisting of six classes, in which the sequence of classes corresponds to the mean age of subjects in each class. (Appendix B)

According to Marr and Nishihara (1977) vision is a process that produces descriptions of the external world which are useful to the viewer; they argue that for the purposes of recognition, the most useful kind of description is object-centered rather than viewer-centered. Object-centered descriptions are defined relative to the objects themselves, while viewer-centered descriptions are defined relative to the viewer.

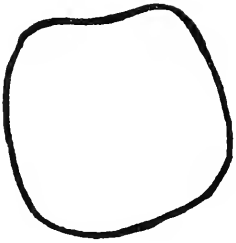
As we have seen, Willats has demonstrated that children's drawings of rectangular objects may be described in the various systems of projective geometry, and that as children get older, they use systems of increasing complexity in order to produce drawings which are increasingly effective as representations: drawings, that is, in which spatial relationships between parts of the object may more readily be seen, so that the object depicted may more readily be recognized. Drawings in all common projection systems, up to and including "naive perspective" may in theory be derived from wholly object-centered representations. Nevertheless, since the transformations on which these drawings are based may be described in terms of projective geometry, such drawings, in fact, do imply a particular point or direction of view; it may be that, particularly with older children, transformations from viewer-centered representations, as well as from object-centered representations may play a part in the drawing process. If this is so, then we might expect as children get older they learn to place objects in a position which is useful for drawing, so that there is correspondence between their selected viewpoint, and the point of direction or view implied in the drawing.

Procedures of the Study

In this study, a random sampling of 64 children (age 6, 8, 10 and 12 years) was drawn from two school districts. Sixteen children comprised each age group. Mean ages for each group were: 6 years, 5 months; 8 years, 7 months; 10 years, 7 months; and 12 years, 7 months. Both the 6- and 10-year-old samples were comprised of 75 percent girls and 25 percent boys. The 8-year-old sample was comprised of an equal number of boys and girls. The 12-year-old sample consisted of 44 percent boys and 56 percent girls.

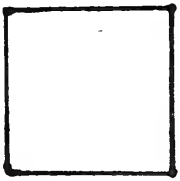
Mean Age in Years

CLASS 1
PRE SINGLE ASPECT



5.1

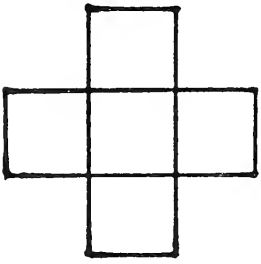
CLASS 2
SINGLE ASPECT



6.6

6.5

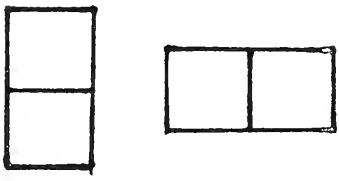
CLASS 3
MULTIPLE ASPECT



7.9

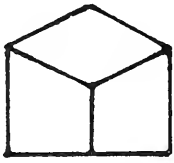
8.7

CLASS 4
HORIZONTAL AND
VERTICAL OBLIQUE



9.6

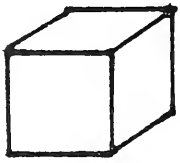
CLASS 5
NEAR OBLIQUE



10.5

10.7

CLASS 6
OBLIQUE



11.6

12.7

The Experiment

A room outside the regular classroom was used to conduct the experiment in each of the schools from which the sample population was drawn (two elementary and two middle schools). The room was equipped with a table, chair and grid at the appropriate height for each age level. In the elementary schools, two tables were used: one at a height of 20 inches, the other at 26 inches. A table height of 29 inches was used at the middle schools. Children were able to select the table which provided the most suitable drawing position. On the wall was placed a grid measuring 36 x 35 inches. Each grid was 5 x 7 inches. The grid was four columns wide and seven columns in height. The grid extended from the front edge of the table 16 inches. The drawing surface was a 12 x 18 inch sheet of white drawing paper placed at the front edge of the table. A one inch tape line separated the drawing paper from an 18 x 18 inch axis sheet, used for placement of the stimulus objects by the subject. Each subject was photographed against the wall grid to record angle of view and eye point while drawing each object. One hundred ninety-two drawings comprised the total sample.

Each subject was tested individually. Upon entering the room, the subjects were told that they would be given three objects to draw, one at a time, and that a photograph would be taken as they drew. They were instructed to look at each object and handle it as long as they wished. After studying the object, when they were ready to draw, they were to place the object on the axis paper in any position they found most suitable for drawing. They were instructed to select a marker and make their drawing. The subjects were given the stimulus objects in random order. The objects were identified as a cube (C), cube with cube added (C+) and cube with cube extracted (C−).

After each subject completed each drawing, the experimentor drew a line around the stimulus object on the axis sheet and recorded the faces of the object relative to the subject's line of sight.

Descriptive Analysis of the Study

Descriptive analysis of the data was made for distribution of drawings by Class and developmental sequence characterized by three Transformation Systems, i.e., Orthographic Projection, Horizontal and Vertical Oblique Projection and Oblique Projection; for each age group (N = 48) and the total sample (N = 192).

For all age levels, 30 percent of the drawings were assigned to Class 2; 24 percent to Class 3; 11 percent to Class 4; 16 percent to Class 5 and 19 percent to Class 6.

For categorization of transformation systems, 53 percent of the drawings occur in stage I — Orthographic Projection; 12 percent in stage II — Horizontal and Vertical Oblique; and 35 percent in stage III — Oblique.

For distribution of drawings by Class and Transformation Systems for each age level (N = 48), the following results were obtained:

Table 1 illustrates that for the six-year-old sample, 33 drawings assigned to Class 2 — Single Aspect; 15 to Class 3 — Multiple Aspect. All the drawings in this sample were assigned to Transformation System I — Orthographic Projection.

The eight-year-old sample illustrated in Table 2 was comprised of 18 drawings in Class 2 — Single Aspect; 17 drawings in Class 3 — Multiple Aspect; 3 drawings in Class 4 — Horizontal and Vertical Oblique; 7 drawings in Class 5 — Near Oblique and 2 drawings in Class 6 — Oblique. 36 drawings were assigned to Transformation Sys-

TABLE 1

Distribution of Drawings by Class and Transformation System for Six Year Old Subjects

	TRANSFORMATION SYSTEM			
CLASS	I	II	III	N
1	33			33
2	15			15
3				
4				
5				
6				
N	48			48

TABLE 2

Distribution of Drawings by Class and Transformation System for Eight Year Old Subjects

	TRANSFORMATION SYSTEM			
CLASS	I	II	III	N
1	1			1
2	18			18
3	17			17
4		3		3
5			7	7
6			2	2
N	36	3	9	48

tem I — Orthographic Projection; 3 drawings to Transformation System II — Horizontal and Vertical Oblique; and 9 drawings to Transformation System III — Oblique. One drawing was assigned to Class 1, System I; Pre Single Aspect, Orthographic Projection.

Table 3 gives the distributions for the ten-year-old sample. It shows that 5 drawings occurred in Class 2 — Single Aspect; 11 in Class 3 — Multiple Aspect; 12 in Class 4 — Horizontal and Vertical Oblique; 13 in Class 5 — Near Oblique; and 7 in Class 6 — Oblique. For categorization of Transformation Systems in this sample, 16 drawings occur in System I — Orthographic Projection; 12 in System II — Horizontal and Vertical Oblique; and 20 in System III — Oblique.

For twelve-year-old subjects, Table 4 shows 3 drawings assigned to Class 3 — Multiple Aspect; 7 to Class 4 — Horizontal and Vertical Oblique; 11 to Class 5 — Near Oblique; and 27 to Class 6 — Oblique. Transformation System I — Orthographic accounted for 3 drawings; System II — Horizontal and Vertical Oblique, 7 drawings; and System III — Oblique, accounted for 38 drawings.

For the category of orientation of drawings by face and edge to viewer's line of sight, the following distributions were recorded. 69 percent of the drawings were oriented by face of the object to the viewer's line of sight; and

TABLE 3

Distribution of Drawings by Class and Transformation System for Ten Year Old Subjects

	TRANSFORMATION SYSTEM			
CLASS	I	II	III	N
1				
2	5			5
3	11			11
4		12		12
5			13	13
6			7	7
N	16	12	20	48

TABLE 4

Distribution of Drawings by Class and Transformation System for Twleve Year Old Subjects

	TRANSFORMATION SYSTEM			
CLASS	I	II	III	N
1				
2				
3	3			3
4		7		7
5			11	11
6			27	27
N	3	7	38	48

31 percent of the drawings were oriented by edge of the object to the viewer's line of sight.

Percentage of drawings oriented to stimulus objects by face and class to viewer's line of sight, are the following for all age groups: Class 2 — Single Aspect, 38 percent; Class 3 — Multiple Aspect, 35 percent; Class 4 — Horizontal and Vertical Oblique, 16 percent; Class 5 — Near Oblique, 7 percent; and Class 6 — Oblique, 16 percent.

The percentage of drawings oriented to stimulus objects by edge and class to viewer's line of sight is as follows: Class 2 — Single Aspect accounts for 16 percent; Class 3 — Multiple Aspect accounts for 18 percent; Class 4 — Horizontal and Vertical Oblique, 0 percent; Class 5 — Near Oblique, 37 percent; and Class 6 — Oblique, 29 percent.

Table 5, Distribution of Drawings by Orientation to Face and Edge by Class For Six-Year-Old Subjects, shows that 37 drawings were oriented by face, and of these, 25 were assigned to Class 2 — Single Aspect and 12 to Class 3 — Multiple Aspect. Eleven drawings were oriented to edge. Of these, 8 were in Class 2 — Single Aspect and 3 were in Class 3 — Multiple Aspect.

Table 6 reveals that for the eight-year-old sample, 39 drawings oriented to face and 9 to edge. Of those drawings oriented to face, 17 were in Class 2 — Single Aspect; 14 in Class 3 — Multiple Aspect; 4 in Class 4 — Horizontal and Vertical Oblique; 2 in Class 5 — Near Oblique; and 1 each in Class 1 and 6, Presingle Aspect and Oblique. Orientation to edge was evidenced in 9 drawings, 5 drawings in Class 5 — Near Oblique; 1 drawing each in Classes 1, 2, 3 and 6, Presingle Aspect, Single Aspect, Multiple Aspect and Oblique.

For the ten-year-old sample, Table 7 shows 32 drawings oriented to face and 16 oriented to edge. 5 drawings were assigned to Class 2 — Single Aspect; 7 to Class 3 — Multiple Aspect; 11 to Class 4 — Horizontal and Vertical Oblique; 5 to Class 5 — Near Oblique and 4 to Class 6 — Oblique. In drawings oriented to edge, there were 4 in Class 3 — Multiple Aspect; 1 to Class 4 — Horizontal and Vertical Oblique; 8 to Class 5 — Near Oblique; and 3 to Class 6 — Oblique.

Table 8 shows that for the twelve-year-old sample, 25 drawings oriented to face and 23 drawings oriented to edge of the stimulus objects. In orientation to face, 2 drawings comprised Classes 3 and 5, Multiple Aspect and Near Oblique; 7 in Class 4 — Horizon-

TABLE 5

Distribution of Drawings by Orientation to Face and Edge by Class for Six Year Old Subjects

	CLASS						
	1	2	3	4	5	6	N
FACE		25	12				37
EDGE		8	3				11
N		33	15				48

TABLE 6

Distribution of Drawings by Orientation to Face and Edge by Class for Eight Year Old Subjects

	CLASS						
	1	2	3	4	5	6	N
FACE	1	17	14	4	2	1	39
EDGE	1	1	1		5	1	9
N	2	18	15	4	7	2	48

TABLE 7

Distribution of Drawings by Orientation to Face and Edge by Class for Ten Year Old Subjects

	CLASS						
	1	2	3	4	5	6	N
FACE		5	7	11	5	4	32
EDGE			4	1	8	3	16
N		5	11	12	13	7	48

TABLE 8

Distribution of Drawings by Orientation to Face and Edge by Class for Twelve Year Old Subjects

	CLASS						
	1	2	3	4	5	6	N
FACE			2	7	2	14	25
EDGE			1		9	13	23
N			3	7	11	27	48

tal and Vertical Oblique; and 14 to Class 6 — Oblique. Orientation to edge shows 1 drawing assigned to Class 3 — Multiple Aspect; 9 to Class 5 — Near Oblique; and 13 to Class 6 — Oblique.

Descriptive analysis of Correspondence Between Selected Viewpoint and Implied Viewpoint for Each Object for each age group are illustrated in Tables 9 through 12.

Distributions relative to correspondence were analyzed relative to the three stimulus objects — cube (C), cube with cube added (C+) and cube with cube extracted (C−) — for each age group in the sample.

For the stimulus object *C*, 12 of the drawings showed correspondence by six-year-olds; 14 by eight-year-olds; 13 by ten-year-olds; and 16 by twelve-year-olds.

There was no correspondence for stimulus object *C* in 4 of the six-year-old drawings; 3 of the eight-year-olds; and 3 of the ten-year-olds.

For stimulus object *C*−, 13 of all drawings by six-year-olds showed correspondence; 13 of the eight-year-olds; 15 of the ten-year-olds; and 16 of the twelve-year-olds.

No correspondence was evidenced for *C*− in 3 drawings of the six-year-old sample; 2 of the eight-year-old sample; and 1 in the ten-year-old sample.

For stimulus object *C*+, 11 of the six-year-old drawings showed correspondence; 15 of the eight-year-olds; 15 of the ten-year-olds; and 16 for the twelve-year-olds.

TABLE 9

Correspondence Between Selected Viewpoint and Implied Viewpoint for Each Object for Six Year Old Subjects

OBJECT	CORRE-SPONDENCE	NO CORRE-SPONDENCE	N
C	12	4	16
C −	13	3	16
C +	11	5	16
N	36	12	48

TABLE 10

Correspondence Between Selected Viewpoint and Implied Viewpoint for Each Object for Eight Year Old Subjects

OBJECT	CORRE-SPONDENCE	NO CORRE-SPONDENCE	N
C	14	3	17
C −	13	2	15
C +	15	1	16
N	42	6	48

TABLE 11

Correspondence Between Selected Viewpoint and Implied Viewpoint for Each Object for Ten Year Old Subjects

OBJECT	CORRE-SPONDENCE	NO CORRE-SPONDENCE	N
C	13	3	16
C −	15	1	16
C +	15	1	16
N	43	5	48

TABLE 12

Correspondence Between Selected Viewpoint and Implied Viewpoint for Each Object for Twelve Year Old Subjects

OBJECT	CORRE-SPONDENCE	NO CORRE-SPONDENCE	N
C	16		16
C −	16		16
C +	16		16
N	48		48

No correspondence was evidenced in 5 of the six-year-old drawings and one each in both the eight- and ten-year-old samples, for stimulus object *C+*.

The total sample (N = 192) for all three stimulus objects shows that a total of 169 drawings evidenced correspondence between selected viewpoint and implied viewpoint and, that only 23 drawings in the sample evidenced no correspondence.

Summary and Conclusions

The basic assumptions underlying this study were that:

1. Drawing of rectangular objects by children may be described in the various systems of projective geometry.
2. As children get older, they use systems of increasing complexity in order to produce drawings which are increasingly effective as representations.
3. The transformations on which these drawings are based may be described in terms of projective geometry; such drawings imply a particular point or direction of view, so that there is correspondence between selected orientation to face or edge primitives and the transformations used in drawing.
4. Children, as they get older, learn to place objects in a position which is useful for drawing, so that there is correspondence between the selected viewpoint and the point or direction of view implied in the drawing.

The results of this study support the assumption that when drawing rectangular objects, children use representations which can be described in the various systems of projective geometry, and as they get older, use increasingly more complex systems. 53 percent of all drawings in the sample (N = 192) were characterized as Orthographic Projections; 12 percent as Horizontal and Vertical Oblique Projections; and 35 percent as Oblique Projections. Further, for the six- and eight-year-old samples (N = 96) 87 percent of the drawings were characterized as Orthographic Projections, the least complex projection system. However, for the 10- and 12-year-old samples (N = 96) 20 percent of the drawings were characterized as Horizontal and Vertical Oblique Projections and 60 percent of the drawings were characterized as Oblique Projections, the most complex projection system.

The assumption that there is correspondence between face or edge primitives and implied view point as characterized by the projection systems used seems to be supported. For the total sample (N = 192) 69 percent of the drawings were oriented by face to the viewer's line of sight and 31 percent were oriented by edge to the viewer's line of sight. Of those drawings oriented by face to viewer's line of sight, 89 percent were accounted for by transformations characterized as Orthographic and Horizontal and Vertical Oblique Projections. Transformations based on Oblique Projections accounted for 66 percent of all drawings oriented by edge to the viewer's line of sight.

That 88 percent of all drawings in the sample (N = 192) for all three stimulus objects evidenced correspondence with the selected direction or point of view indicates that most children, when given the opportunity to position the objects, will place these objects in a way that is useful to them in drawing. In addition, the data shows that by age level, as the children get older, there is increasing correspondence between selected direction of view and implied direction of view in the drawings for all three stimulus objects. For six-year-olds, 75 percent of the drawings show correspondence; for eight-year-olds, 88 percent of the drawings show correspondence; for the ten-year-olds, 90

percent of the drawings show correspondence; and for twelve-year-olds, 100 percent of the drawings evidenced correspondence.

Thus, the data indicates that children, as they get older, learn to place objects in a position useful for drawing so that there is correspondence between the selected viewpoint and the point of direction or view implied in the drawing.

Acknowledgments

I would like to acknowledge research support for this study from Michigan State University and to thank particularly John Willats, Faculty of Art and Design, Northeast London Polytechnic, for his helpful discussions and for sharing with me his on-going research findings in this area of investigation.

I would also like to express my appreciation to Mr. Frank Philip, Director, ARTS Project, Waverly Public Schools, for his cooperation in facilitating various aspects of the study; and also the school administrators, parents and children for their cooperation and participation.

References

Marr, D. and Nishihara, H. K. Representation and recognition of the spatial organization or three-dimensional shapes. *The Artificial Intelligence Laboratory,* Cambridge, Massachusetts, 1977.

Willats, J. How children learn to draw realistic pictures. *Quarterly Journal of Experimental Psychology,* 1977, **29,** 367-382.

Willats, J. Implicit rules: some of the truth about children's drawings. Victoria, J. and Sacca, E. J. Eds. *Presentations on Art Education Research,* 1979, No. 3, 11-23.

Willats, J. What do the marks in the picture stand for? The child's acquisition of systems of transformation and denotation. *National Art Education Association Conference,* 1980, Atlanta, Georgia.

James Victoria
Department of Art
Michigan State University
East Lansing, Michigan 48824

COMPOSITIONAL DESIGN AS A PERCEPTUAL DETERMINANT OF AESTHETIC JUDGMENT[1]

Calvin F. Nodine
Temple University

There has been much speculation from both artists and art connoisseurs alike about how compositional design affects the way paintings are viewed and judge aesthetically. Typical of such speculations is one by Dondis (1973) stating that what holds true for both complex shapes and complicated compositions is "... the eye seeks out the felt axis in any visual event in an unending process of establishing relative balance" (p. 27). Yet, there is little scientific evidence to support the claim of Dondis, and others, who have emphasized the significant role that the eye plays in the analysis of visual displays, and in particular the analysis of paintings.

The purpose of my paper is to examine the relationship between compositional design, visual scanning behavior and aesthetic judgment. Compositional design refers to the arrangement of visual elements — lines, colors and forms — which make up a painting. This definition, which stresses design, reflects the view of the Neotraditionalist artist, Maurice Dennis, who said that a painting "... before it is a battle horse, a nude woman, or some anécdote is essentially a plane surface covered with colors arranged in a certain order" (Chipp, 1968, p. 94). Dennis' definition can be applied to more traditional styles of art by re-emphasizing the very issue he was fighting against, the representational significance of the arrangement of visual elements.

For the artists that I chose to study, visual elements were combined into forms denoting real-world objects and events. Thus, emphasis shifts from the perceptual arrangements of visual forms to the logical arrangement of visual content. There has been much written about this relationship dating back to the Greeks who thought that compositional harmony could be expressed mathematically (Hambridge, 1920). From the Greeks came geometric relationships derived from the Golden Section (Boas and Wrenn, 1964). These geometric relationships were integrated into formal compositional rules by later artists, in particular, Renaissance painters.

Bouleau (1963) has referred to these formal compositional rule systems as "The Painter's Secret Geometry." He has shown how this geometry influenced not only Renaissance but modern painters as well.

Bouleau's analysis examines the thesis that formally-derived geometric relationships guided the arrangement of visual content for many well-known artists. Although his work focuses on representational painting, he also shows how the Golden Section has been used by some nonrepresentational painters (e.g. Modrian).

Although Bouleau's thoughtful analysis of paintings provided me with a scientific basis for testing the relationship between compositional design and looking behavior, the inspiration for this paper really came from Isabel Bishop, a well-known New York figurative painter. It was she, through her paintings, who first introduced me to the significance of the golden section. She believes that the diamond formed when strings are stretched diagonally across her rectangular canvas and the square within it reveals "...

an especially significant area in the content of a picture." (Lunde, 1975, p. 73). You will see one of her paintings later.

There have been a number of scientific studies of the way that people look at paintings. Probably the best known studies are those of Buswell (1935) and Brandt (1945) who recorded eye movements of subjects as they looked at a variety of visual displays among which were paintings. Buswell distinguished two types of fixations as the eye analyzed a painting: survey fixations which occurred early and were designed to provide a general characterization of the painting; examination fixations, usually of longer duration, concentrated on visual features. More recent evidence by Antes (1974) and my own research (Nodien, Carmody & Kundel, 1978; Nodine, Carmody & Herman, 1979) suggest that *survey* fixations not only serve to provide an overall characterization of the painting but also serve to define clusters of interrelated visual elements which are then subjected to a detailed analysis by longer-duration *examination* fixations.

None of the above-mentioned studies have actually manipulated the design of a painting in order to see how it affects the way the eye analyzes the painting, or how this analysis is linked to judgments as to which design is more pleasing aesthetically. The present study remedies this shortcoming by focusing on the relationship between looking and judging. It asks first, how the ordering of visual content influences the viewer's pattern of attention, and second, whether this pattern of attention reflects an analysis of perceptual relationships used in making aesthetic judgments.

The present study, more specifically, compares the visual scanning behavior to two paintings having *identical* visual elements but *different* compositional arrangements. This was accomplished by experimentally manipulating the visual elements in a group of paintings selected on the basis of Bouleau's analyses. The manipulation consisted of changing the relationship among visual elements by cutting the paintings apart, re-ordering the parts, and pasting them back together. This manipulation had the effect of producing a new composition having the same visual elements as the original painting. The proportions of the painting remained relatively unchanged. Only the design changed. The effect, as you will see, was to produce a set of paintings in which new relationships among visual elements changed the representational significance of the compositions.

Method

It is the relationship between the design and content of visual elements — the unique mapping of visual content on to a formal geometric structure — that unifies a painting compositionally according to Bouleau's analysis. This relationship is examined in his analysis of Seurat's painting, *La Parade,* chosen for the study because of Seurat's strict adherence to geometric formalism in the design of his paintings. I shudder to think what Seurat would have said about my altered version which destroys the balance among visual elements so carefully worked out in the original. The original and altered versions of *La Parade* are shown in Figure 1. For the moment, ignor the broken vertical lines and numbers. I shall return to them later when I discuss the results. Two more of Seurat's paintings were also used in the study. One was *The Models* shown in Figure 2 in the original and altered version. The other pair consisted of two sketches for *La Grande Jatte:* an early sketch and a final sketch shown in Figure 3. The alterations in this case were done by the artist, of course.

Two other paintings were altered. One was Isabel Bishop's *Five Women*

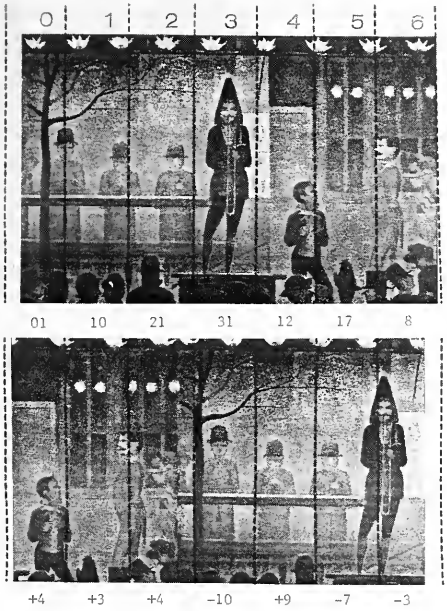


Fig. 1 — La Parade

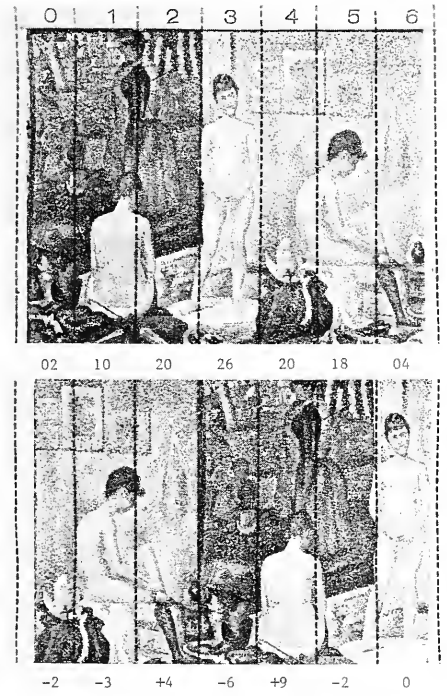


Fig. 2 — The Model

Fig. 3 — La Grande Jatte

Walking #2 shown in Figure 4 in the original which displays the formal symmetry that her paintings are known for, and my alteration which breaks up this formal symmetry. The diagonal lines to the square and rectangle reveal the diamond which, according to Bishop, plays a key role in the analysis of the composition by the eye by virtue of its likelihood of receiving the viewer's early attention (Bishop, 1980).

The fifth painting, again chosen for its expression of formal symmetry, was Piero della Francesca's *Flagellation* shown in the original form and altered form in Figure 5. In this case the alteration deletes a key compositional element from a representational standpoint, the Flagellant, without which the narrative sense of the painting is lost. The formal symmetry is also taken out of balance by the removal of the space occupied by the flagellant which changes the proportions of the architectural structure

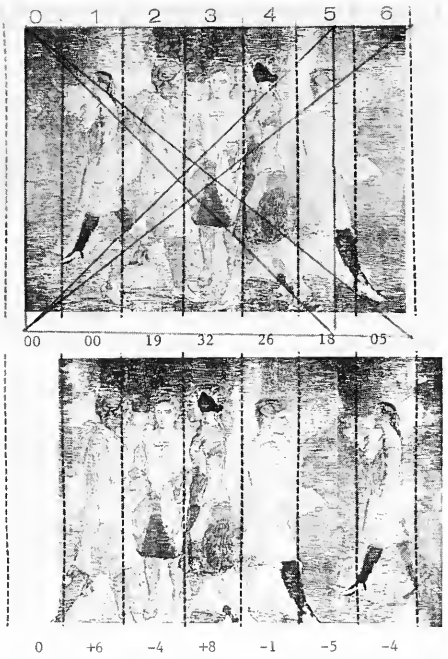


Fig. 4 — Five Women Walking #2

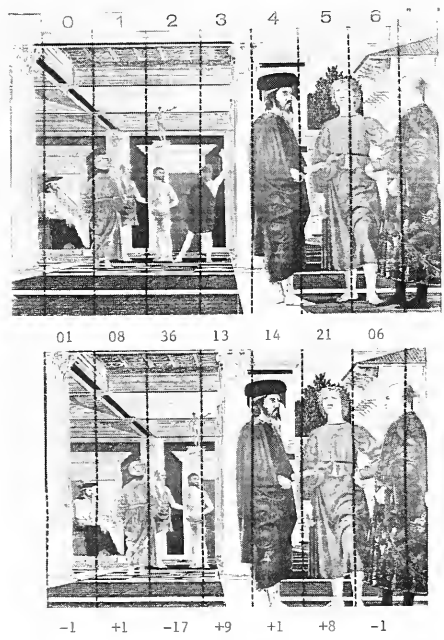


Fig. 5 — The Flagellation

housing the group of figures on the left containing Christ.

The five pairs of paintings were shown to eight adult subjects. All but two of these subjects were either scientists or engineers. An artist and art educator completed the sample.

The two versions of each painting were presented sequentially, the order of the original and altered versions being counterbalanced over subjects. Subjects were given 5 seconds to veiw each version of the pair. Following presentation, subjects were instructed to judge which of the two versions represented a more harmonious arrangement of visual elements and subject matter and to explain the reasons for their choice.

As the subjects looked at the paintings, their eye movements were recorded using a Biometrics eye-movement monitor interfaced to a PDP 11/40 computer.

The eye movement monitor consisted of two infrared sensors attached to a pair of spectacles. The right sensor measured horizontal movements and the left sensor measured vertical movements. The subject's head was held stationary by a combination headholder and bite-board. Movements of the eyes were sensed and translated into voltage changes which were then digitized and interpreted as changes in fixation or attention within the field of view. A more technical discussion of the eye-movement system is presented in Carmody, Nodine & Kundel (1980).

During the 5 seconds in which subjects viewed each version of a painting, shifts in attention produced unique fixation patterns. For analysis purposes, these fixation patterns were superimposed over the appropriate version of a painting. Each version of a painting was divided into seven columns. The amount of attention in terms of time spent fixating each column was determined for each subject.

All subjects were required to begin scanning each picture in the lower left corner of column 5. This insured uniformity of starting location and prevented the subject from fixating the center of the display initially. This procedure resulted in a bias which increased the amount of looking in column 5. The attention time in column 5 was corrected by subtracting out initial fixations.

Results

All of the paintings described above were designed using formal compositional rules based on the golden section. These rules specify potential sites for the placement of key visual content, but not the form that this content will take, nor the order in which it will be arranged. These decisions are left to artistic intuition.

Arbitrarily re-arranging visual content effectively severs logical connections among visual forms carrying key representational information. The arrangement of visual content is lacking, and, it is this logical issue that should be the focus of the subject's judgments of compositional harmony.

This hypothesis was tested by asking three questions of the eye movement data. First, how do subjects start looking at a painting? Is their initial glance influenced by past experience, especially after having seen one version of a painting? Second, how do alterations in composition affect the way the painting is viewed? What shifts in attention occur? Third, how do changes in the way the painting is viewed affect judgments of compositional harmony?

The first question asks how past experience affects the way that visual scanning is initiated. Does the fact that Western Painting, which traditionally arranges key content information around the center of the composition, cause the eye to seek information in the center of the painting as so many artists believe?

To answer this question, I looked at the first four fixations of all eight subjects over all five pairs of pictures, a total of 80 eye-movement records. The results indicate that attention shifts from the pre-determined starting point in the lower right hand corner of column 5 (proportion of fixations in column 5 on fixation 1 was .88), which all subjects were required to fixate first, to the center of the display designated by columns 2, 3 & 4 by fixation 3 (proportion = .72), and to left center columns 2 & 3 containing Bishop's diamond by fixation 4 (proportion = .64). Thus, in less than a second, most subjects were fixating the center of the painting. Although there was some variability as to whether fixation 3 was left, right or dead center, there is no question that an initial looking bias existed in my subjects for the center of the painting. From a perceptual viewpoint, moving the eyes to the center would yield more effective use of peripheral vision allowing an overall glimpse of the painting which might be useful in assessing over compositional design.

Interestingly, the initial looking bias was not altered by looking at first one version of the painting and then the other. The pattern of the first four fixations was almost identical for painting in original-altered and altered-original sequences.

Fixation data were analyzed by superimposing the same six column grid over each version of the five paintings. Each column represents a width of 7.2 cm or a 5 degree visual angle. Visual content in each of these columns was related to eye-fixation patterns.

Although the initial four fixations focused on the center of the painting, fixation patterns during the remaining 4 seconds of viewing differed significantly for each version of a painting. These fixation pattern differences were

examined by looking at shifts in attention among the six columns between one version of the pair and the other. As expected, shifts in attention were unique for each pair of paintings. Let me illustrate.

The first pair was Seurat's *Models*. Subjects gave the standing model in the center a great deal of attention in the original version as illustrated by the typical fixation pattern shown in Figure 6A. In the altered version, attention shifted to the sitting model on the left. This shift occurred, according to subject explanations, because of the unnatural perspective of the room that, unknown to them, resulted from my reversing right and left halves of the painting so that the back wall on the right side of the original became left front wall of the altered version and vice versa. All eight subjects who chose the original remarked about this perspective problem, a representational issue that detracted from the compositional harmony of the altered. Their shifts in attention from the original to the altered version measured as percent viewing time and percent change in viewing time in columns 0-6 are shown below the original and altered versions of each painting in Figures 1-5. The top row gives the percent of fixation time in each column for the original. The bottom row gives the percent change in fixation time from original to altered version. Returning to Figure 2, the numbers below the altered version indicate that both of the sitting models received more attention in this version than in the original version. Another visual feature frequently mentioned was the painting within the painting of *La Grande Jatte* which,

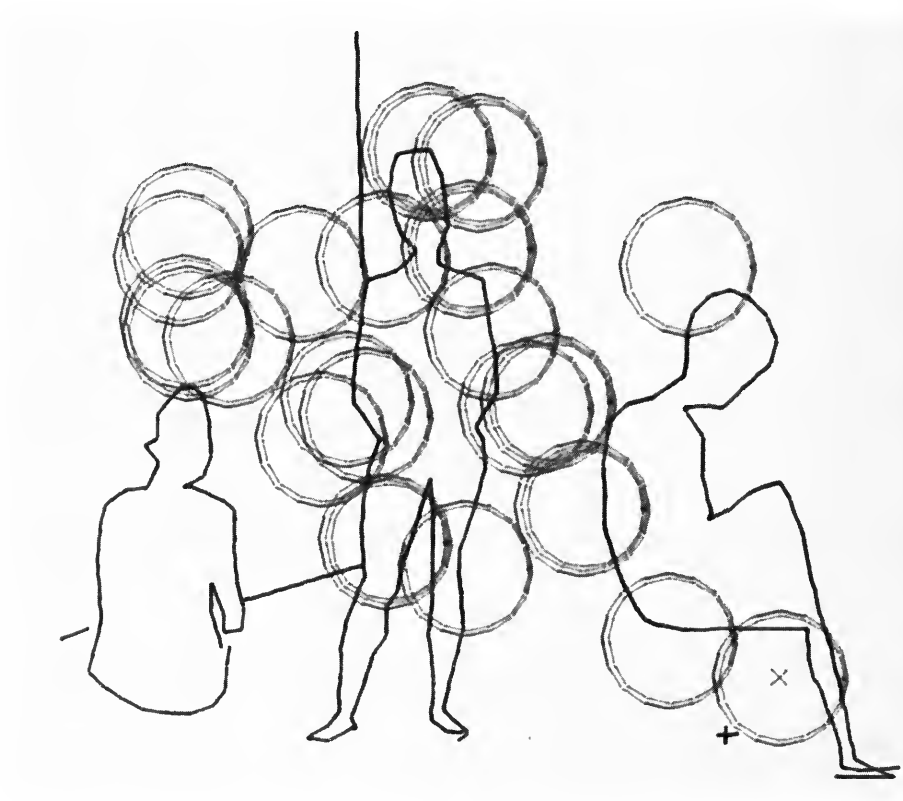


Fig. 6A — The Models (original)

along with the standing model on the right, received increased attention in the altered version as shown in Figure 6B.

The relationship between shifts in attention and choices for one composition over the other was expressed similarly in all of the remaining pairs.

In Seurat's *Parade* all but one subject chose the original version in which the visual elements, according to Bouleau's analysis, are carefully arranged to balance attention among orchestra, trombone player and conductor. The percentages in Figure 1 indicate that in the altered version, attention shifted to the conductor on the left who is no longer conducting, or to the orchestra which, by being moved to right center, steals the solo away from the trombone player on the far right.

Turning to a more contemporary painter, Isabel Bishop's painting produced more disagreement among subjects about which version is more harmonious compositionally, and, two different patterns of looking at each version. The altered version was preferred 4-3 with one undecided. Those that chose the original stressed the geometric balance of movement in the composition. Those that chose the altered version stressed the dynamic feeling of movement associated with the asymmetrical arrangement of figures. Attention was shifted between the three women on the left and the pair on the right whose walking directions produced varied patterns compared with the synchronized walking patterns depicted in the original. Differences in choice produced differences in both patterns of attention, and change, between original and altered versions. Figure 4 indicates that attention patterns for both choices

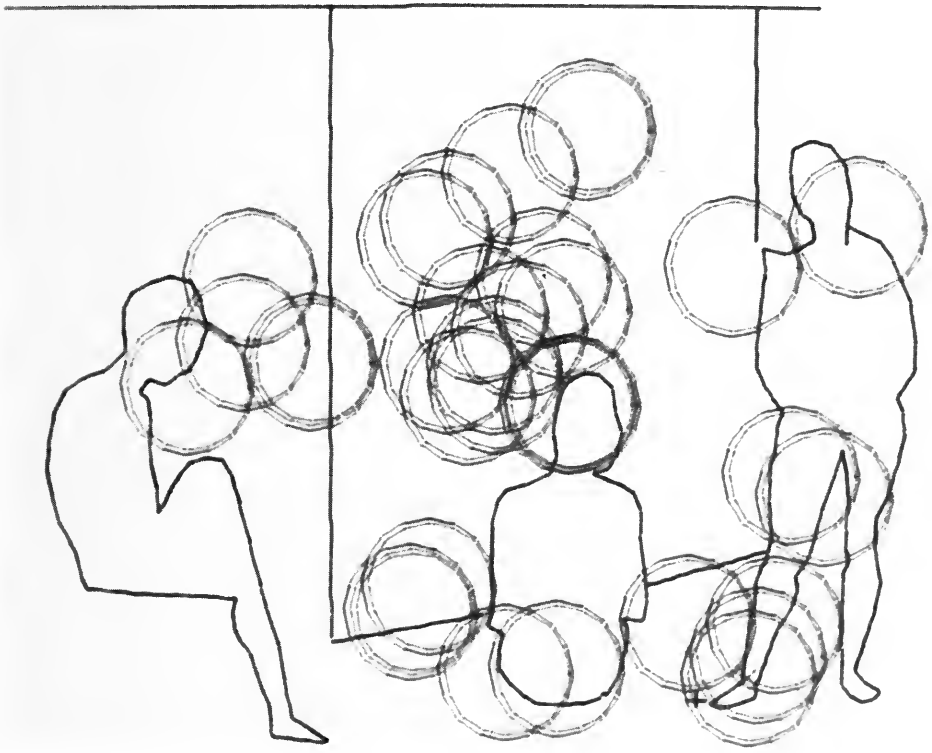


Fig. 6B — The Models (altered)

focus on the three women in the center in the original.

The altered version produced differences in attention patterns. The original choice focused on the woman in purple (second from right) moving left, which presumably upset the balance of the composition according to their preference. The altered choice focused on the opposition between the same woman in purple (third from right row) moving left and the woman with one black stocking (last on right) moving right, which created a dynamic movement-countermovement. This is reflected in the fixation pattern in Figure 7. You will also note in Figure 4 that attention within the diamond located in column 3, which is a key area for Bishop, increased with the shift of the woman in purple to column 3 in the altered version.

Moving back in time to the Renaissance, Piero della Francesca's *Flagellation* was the most difficult painting to alter, and, although the changes in this picture were generally less noticeable according to subject's reports, the alterations nevertheless produced significant changes in attention referring back to Figure 5. The original was preferred over the altered version 6-2. What is interesting about this painting is how the artist balanced the three visually dominant figures in the right foreground with the group containing the central action in the left background by framing the left group within an architectural space. Many of the subjects commented on this balance issue which was noted in both versions but somewhat less so in the altered version. The other significant feature of the composition is the flagel-

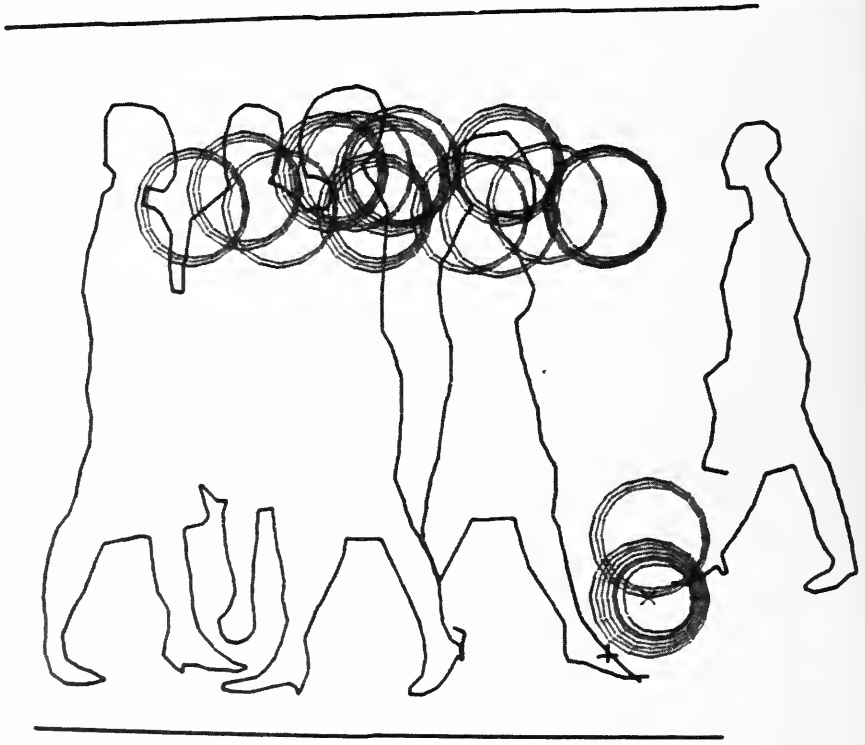


Fig. 7 — Five Women Walking #2 (altered)

lant, whose central placement and raised arm singles him out visually from Christ and the accompanying figures. The action represented in the composition and the recipient of it, draws a great deal of attention in the original as the typical fixation pattern in Figure 8A shows. When the flagellant is removed attention shifts to the three figures on the right (Figure 8B).

The overall attention patterns shown in Figure 5 confirm this point. Two significant shifts show up when the altered version is presented. First, attention is drawn away from Christ to the void left by the removal of the flagellant. His removal affects the composition both visually and logically, since the actor and action are no longer present — only the recipient. Subject attention shifts to column 3 regardless of the order of the pictures, original-altered or altered-original; so the effect is not due primarily to memory but because of the unresolved action.

Second, the removal of the flagellant changes the actor-action relationship, shifting the bulk of attention to the three figures on the right. Many subjects remarked that these three figures seemed more dominant in the altered version even though they could not point to a difference between the two versions.

All of the pairs considered thus far have compared carefully planned compositions against arbitrary compositions made up of the same elements. The final pair tested the effect of a planned change by the artist from an early sketch of *La Grande Jatte* to a final sketch. The two sketches differ compositionally as indicated in the overlay shown in Figure 9. The final sketch is brighter than the earlier one both here and in the colored original. More importantly from a compositional standpoint, Seurat's final version is more balanced than the earlier one. He gained this balance by (a) removing the standing figure and changing the relationship of the dominant figure grouping on the right (b) adding a distinctive form, the lady with the red

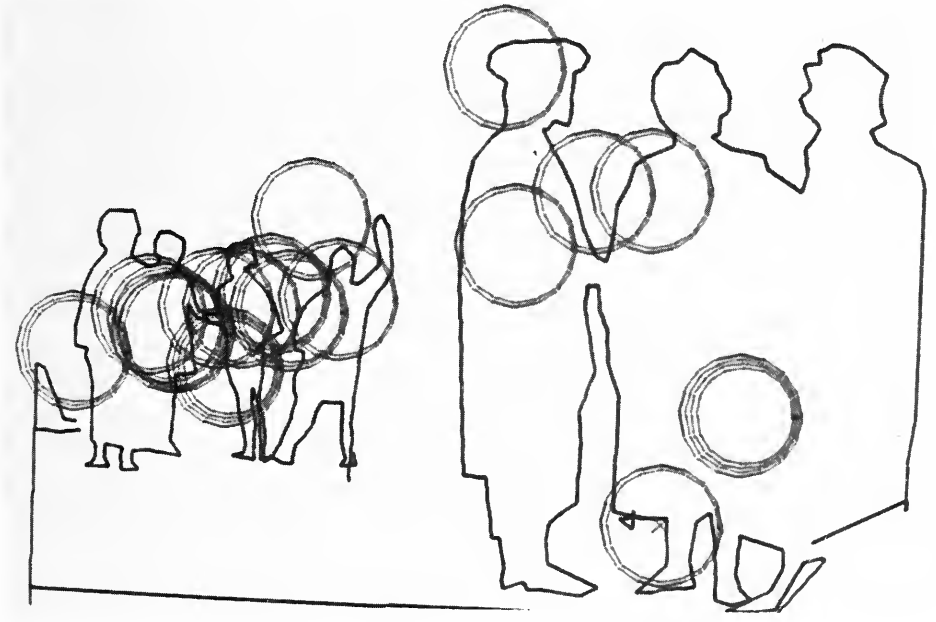


Fig. 8A — The Flagellation (original)

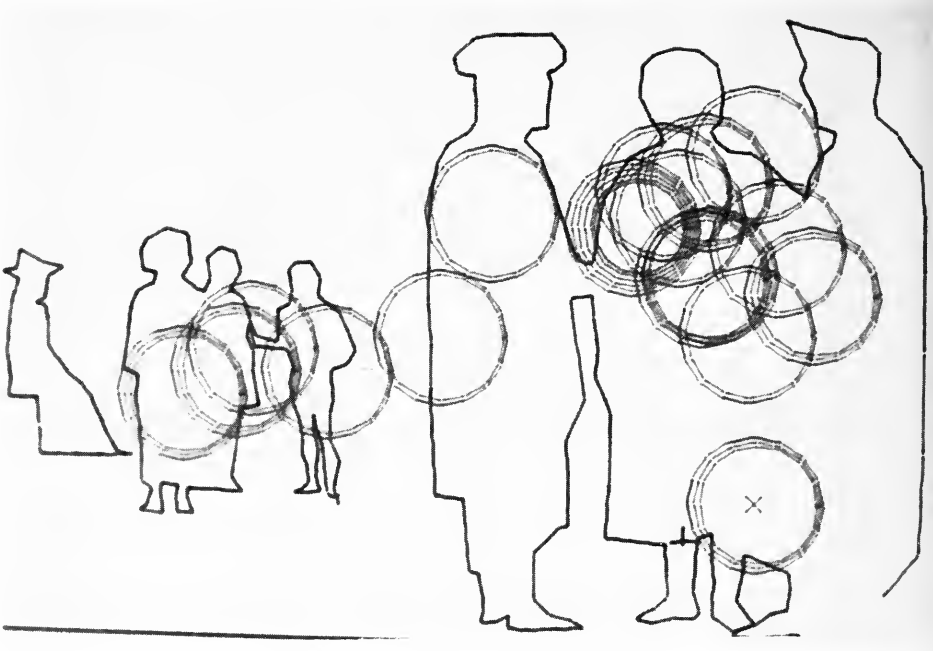


Fig. 8B — The Flagellation (altered)

unbrella, thus creating a central focal point and (c) making minor changes in the arrangement of the minor groupings in the right central and left foreground.

Which version did my subjects choose? The final version, 6-2. Attention patterns (Figure 3) are balanced between left, right and center in the final sketch (top), whereas the earlier sketch (bottom) lacks focus so that attention is overbalanced on the ends, leaving a hole in the center.

The results, as far as Seurat is concerned, support his theory of composition which applies the secret geometry so systematically. Given his penchant for science (Homer, 1964), I think he would have forgiven my brutal treatment of his compositions.

The findings generalize beyond Seurat, however. The arrangement of visual elements directly affects the way the eye analyzes a composition. Initial fixations (1-4) gravitate to the left center of the painting due to a looking bias that reflects a characteristic of information patterns in pictures generally. Whether the painter's secret geometry, which stresses the importance of the left center of a picture, is the cause or the effect of the looker's bias is not clear. However, the left center area plays a significant role in establishing an overall impression of the arrangement of visual information in a picture.

The model that these finding suggest is one in which visual structure, attention and judgments of compositional design are intimately related.

First, visual structure resulting from the artist's use of formal compositional rules of the type suggested by Bouleau, provides a framework for arranging visual content. The center of the picture is used as a major focal point around which visual content is arranged. Bishop says, "... one can either give this area particular density and clarification leading to it from the ambiguous forms and spaces around

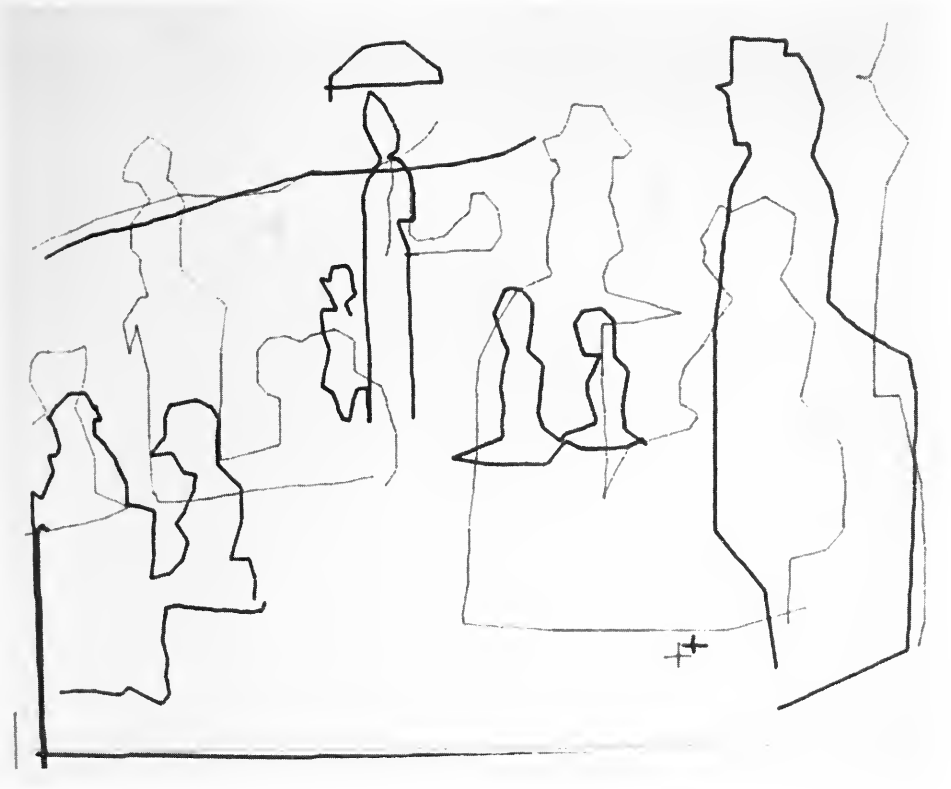


Fig. 9 — The Grande Jatte (overlay)

it, or conversely, leave it empty with clearer forms around it" (Lunde, 1975, pp. 73-74).

Second, based on an overall characterization of the composition derived from initial survey fixations, visual scanning seeks out logical relationships between visual form and content using long-duration examination fixations. The result is a unique fixation pattern with multiple focal points revealing detailed analysis of representational connections among visual content.

Finally, from these attention patterns, inferences can be drawn about the importance assigned to the arrangement of visual content in making judgments about compositional design, which can to some extent be corroborated by subject reports.

This model suggests a number of interesting questions about other relationships between visual structure and perception. For example, what is the nature of the visual-form relationships expressed in non-representational paintings, and how does it differ from representational paintings? (An issue close to Maurice Dennis' heart.) How does art education affect the kinds of relationships that viewers focus on? Our findings suggest that art training may influence attention strategies.

Footnote

1. Based on a paper presented at the National Symposium for Research in Art, University of Illinois, October 7-10, 1980. This study was performed during a research and study leave granted to me by Temple University, 1979-80. I wish to express my appreciation to Isabel Bishop for her encourage-

ment and guidance in designing this study, James J. McGinnis who helped with the data analysis, and Barbara Nodine whose editorial suggestions helped clarify my writing.

References

Antes, J. R. The time course of picture viewing. *Journal of Experimental Psychology,* 1974, **103,** 62-70.

Bishop, I. Personal Communication, August 30, 1980.

Boas, G., & Wrenn, H. H. *What is a picture?* New York: Shocken, 1964.

Bouleau, C. *The painter's secret geometry.* New York: Harcourt, Brace & World, 1963.

Brandt, H. F. *The psychology of seeing.* New York: Philosophical Library, 1935.

Buswell, G. T. *How people look at pictures.* Chicago: University of Chicago Press, 1935.

Carmody, D. P., Kundel, H. L., & Nodine, C. F. Performance of a computer system for recording eye fixations using limbus reflection. *Behavior Research Methods & Instrumentation,* 1980, **12,** 63-66.

Chipp, H. B. *Theories of modern art.* Berkeley: University of California Press, 1968.

Dondis, D. A. *A primer of visual literacy.* Cambridge: MIT Press, 1973.

Hambridge, J. *Dynamic symmetry: the Greek vase.* New Haven: Yale University Press, 1920.

Homer, W. I. *Seurat and the science of color.* Cambridge: MIT Press, 1964.

Lunde, K. *Isabel Bishop.* New York: Abrams, 1973.

Nodine, C. F., Carmody, D. P. & Kundel, H. L. Searching for NINA. In J. W. Senders, D. F. Fisher, & R. A. Monty (Eds.) *Eye Movements and the Higher Psychological Functions.* Hillsdale, N.J.: Erlbaum, 1978.

Nodine, C. F., Carmody, D. P. & Herman, E. Eye movements during visual search for artistically embedded targets. *Bulletin of the Psychonomic Society,* 1979, **13,** 371-374.

Calvin F. Nodine
Department of Educational Psychology
Temple University
Philadelphia, Pennsylvania 19122

CHILDREN'S COMPREHENSION OF PHOTOGRAPHIC REPRESENTATION

Harry Beilin
City University of New York

In this paper I describe a program of research devoted to an understanding of photographic representation. This program is motivated in part by the recognition that in an industrialized society photographs are so pervasive as to significantly affect the consciousness and understanding of both adults and children. Despite the fact that modern photographic technology has been with us for at least 150 years and an estimated billion photographs, if not more, are produced each year throughout the world, it is surprising how little is known of the processes by which photographs come to represent meaning, communicate information, act as instruments of social control and exchange, and serve as aesthetic objects. Nor is very much known about how children acquire the competencies to extract from or impose meaning upon photographs, although photographs are encountered very early in their lives and are used extensively in their education long before formal schooling begins.

Psychologists and others have for the most part treated photographs, either explicitly or implicitly, as though they functioned in the same manner as other pictures and bore the same relation to the objects of representation and the viewer as other pictures. Among psychologists, however, Rudolf Arnheim is an exception. He says, "The photograph has an authenticity from which painting is barred (1974, p. 154)," and, "All I have said derives ultimately from the fundamental peculiarity of the photographic medium. The physical objects themselves print their image by means of the optical and chemical action of light." Thus, "(1) The picture is coproduced by nature and man and in some ways looks strikingly like nature, and (2) the picture is viewed as something made by nature (p. 156)," and lastly, "(the) conviction that the picture was generated by a camera profoundly influences the way he views and uses it (p. 156)."

To a social critic like Susan Sontag (*On Photography,* 1977), there is no question but that the photograph influences the manner in which the world is reacted to; this is quite different from the influence of other means of communication, representation and persuasion. Enough, in fact, to persuade her that photography is inherently an evil force in the present social order, an instrument of perpetuating the status quo and a means of social control that robs the individual of the joy of direct experience, and the social system of the opportunity for change.

To the art critics and artists of the 1800's, the photograph was sufficiently different in kind so that on its appearance it created terror in their hearts and led to Beaudelaire's dramatic declaration, "Henceforth, painting is dead!", even if this reflected at least a partial misunderstanding of both painting and photography. From the 1840's, when modern photography was invented, until recently (the past 20 years) photography was considered as only barely qualified to be considered a legitimate art form for reasons related, interestingly enough, to differences in theories of pictorial repre-

Presented at the National Symposium for Research in Art conference, "Learning in Art," at the University of Illinois, Urbana, October, 1980.

sentation and the relations of such forms to reality. To put it succinctly, these questions concern the fidelity of photographs to reality and their authenticity as documentation of the real. In one view, photographs capture a trace of the object itself. In effect the photographer and the camera merely record what is perceived (a position held by J. J. Gibson). In another view, the photograph is the product of the photographer's conception of the objects of representation. The photograph does not correspond to reality but to the schemata (Gombrich) that structure the picture makers' "dialogue with the world" (Worth, 1981).

This fundamental difference in conception of the nature and function of photographs divides social scientists, humanists, art critics and others who have given serious attention to the nature of photography.

Do the presumed differences between photographs and other pictorial forms have a basis in fact and does the photographic process differ from normal vision? Photographic representation differs from seeing and other modes of picturing in a number of ways. Vision, for one, is not set in a rectangular boundary as is the photograph and related modes of depiction. The photograph shows everything in sharp focus from edge to edge, which does not accord with foveal and peripheral vision. The black and white photograph clearly differs from the world as experienced in color, but even color photographs differ from the experienced color of the world (Snyder, 1980). Photographs differ significantly from other forms of representation in having a fixed station point, that is, they are projections from a single viewing position; paintings and drawings need not be. The photographic image is inexhaustible in ways no other pictorial representation can be, to which any enlargement of a photograph attests. These differences certainly emphasize that the structural characteristics of the camera (its shape, lens, etc.) affect the ultimate character of the photograph and the way it is comprehended. But that is not the entire story, inasmuch as photographic conventions clearly contribute to the creation and understanding of what the photograph is intended to convey. These conventions are evident in the photographer's manipulation and use of lighting to affect mood and attitude, in the darkroom manipulations of montage, of pose and hundreds of details upon which an entire industry of photographic manual publishing feeds. Not only is the professional photographer's expertise based on the exploitation of such conventional knowledge, a good portion of contemporary photographic art is derived from experimentation that leads to the creation of new conventions (as for example in Jerry Uelsmann's montages, or Steven Shore's use of color).

Nevertheless, whether the theorist is a realist or a conventionalist, the view is shared that in ordinary circumstances the beholder views the photograph as portraying a real event having occurred. This is most striking in those cases of political dirty tricks in which photographs are faked for the purpose of embarrassing a political figure or statesman. There are memorable examples from many political campaigns. These darkroom manipulations are based on the assumption that viewers believe that what they see in photographs is a true depiction of reality.

Our research program has devoted two studies to determining some features of the child's belief in photographic fidelity. In the first of these studies (O'Connor, Beilin & Kose, 1981), we sought a test of this oft-observed and commented on phenomenon, in a condition that would stretch belief in the authenticity of photographs to the maximum. We reasoned that if children could be shown to believe in the fidelity of photographs when the

photographs were of an illogical event, even though subjects at the same time could view the actual event, it would be very strong evidence for the existence of the belief in photographic fidelity in children. For this purpose we created an experimental condition in which photographs depicted illogical events. We capitalized on the well-known Piagetian conservation of liquids task, in which liquid is poured from a low wide container to a tall narrow one. Children can be distinguished by whether they are able to judge if the amount has been conserved (i.e., if the amount of liquid is the same or different after the pouring). If they judge correctly they are identified as operational conservers; if not, they are considered preoperational. They might also be transitional between the two states, but we omitted such children from our study. Conservation is also manifest in other quantitative contexts, and we established the cognitive level of our subjects in a pretest by a conservation of number task. We set up an experiment which ultimately had four conditions, and 200 subjects approximately 6 years of age. In the first condition, subjects were presented with a series of color photographic slides of a conservation of liquid task that ended in an illogical outcome. Either before or after this viewing, they saw a standard conservation of liquid task with the actual materials that ended in the standard (i.e., logical) fashion. After viewing both they were asked first if they saw a difference between the conditions and then which was the way the task "really" should be if they saw a difference, either the (logical) materials or the (illogical) photographs. A substantial proportion of both concrete operational (30%) and preoperational children (90%) reported the illogical photographic condition to reflect with fidelity the true condition. The effect was significantly influenced by the order of presentation and the operational level of the child. That is, the operational level children resisted the influence of the illogical photograph, particularly if the real materials condition was presented first.

There were three contrast or control conditions in the experiment. In one, subjects were presented with an illogical conservation outcome using real materials contrasted with a logical-outcome photograph. In this case fidelity judgments were also affected by task presentation order and operational level. In the second, contrast condition subjects were presented with two standard materials conservation conditions, one with an illogical outcome, the other with a logical outcome. In this case the choice between alternatives was random. In the third contrast, we sought to determine whether children would have the same belief in fidelity with drawings of the conservation task as they did with photographs. We found some evidence of an effect, but the pattern of response to the drawings was different. First, with drawings no children reported that they saw no difference between the two conditions (whereas 30% of the concrete operational did so in the illogical photographic condition). Secondly, with drawings, substantially more subjects chose the standard logical condition than was true for the photographic condition. Thus, while drawings elicited a belief that they truly represented what they depict, the effect with photographs was significantly more compelling.

In a further study of photographic fidelity (O'Connor, 1981; O'Connor, Beilin & Kose, 1981), we took note that our first study was based on conservation task judgments. Such judgments are dependent to a significant extent, or so it has been claimed, upon knowledge of the physical properties engaged by that task, such as knowledge of the properties of continuous liquids and discontinuous solids. Since such knowledge could conceivably influ-

ence fidelity judgments, we wished to provide a more stringent test of the fidelity thesis by offering an experimental context in which the task used required judgments that were more logically based than those of a conservation experiment. For this purpose O'Connor used a transitivity task (seriated wooden blocks) in which logical and illogical photographs of the task were contrasted with actual physical objects. (In a transitivity task blocks of heights A and B are compared and independently B and C heights are compared; then a comparative judgment of A and C is sought without the blocks present.) This transitivity study shows that, as one would expect, cognitive level has a consistent effect across both conservation and transitivity tasks, indicating that on the whole more cognitively advanced subjects will resist the influence of illogical photographs and preoperational children will not. This result, however, is affected by presentation order which interacts with the logicality of the tasks. To isolate one effect, we found that when *illogical* outcome materials are paired with a logical outcome photo, subjects choose the illogical materials as the reality to a striking extent (up to 80% for the operational children), irrespective of the task presented first. By contrast, the effect is overwhelming in the conservation task, when the illogical standard materials appear first; otherwise choice between the two conditions is random. We are inclined to interpret this finding as indicating that the materials themselves compel a judgment of reality, even when the photograph is more logical and the materials are in fact illogical. That is, in a highly logically-loaded task like transitivity, children are inclined to trust what is materially present and distrust the photograph. When the task entails more physical knowledge, as in the case with conservation, they are relatively more likely to believe in the fidelity of the photograph, especially if the photo appears first. Children's justifications support this interpretation, as do some of the other findings of the study.

A third study, which we consider a pilot study and will be conducted more extensively shortly (Pearlman and Beilin), is concerned with what we identify as "iconic realism." In this study we were concerned with when and how children come to an understanding of the properties of the photographic surface in contrast to the properties of the object depicted on that surface. The 140 subjects tested were 3-, 4-, and 5-year-olds. They were presented with photographs of objects, such as, an ice cream cone, a glass of orange juice, a lighted candle, etc. The photographs varied in color (black/white vs. color) and size (near life size vs. small). The children first identified the objects and were then asked whether the object or its photograph would continue to exist if its counterpart were destroyed (or died). Lastly, they had to say whether certain physical properties associated with an object were shared by its photographic counterpart. The questions were of the type "If you got very close to this picture, could you smell the rose?" "If it got very hot in here, would the ice cream cone melt?" "If I touched the picture here, would it feel cold?" etc. The child's responses were rated for indicated iconic realism by whether the child attributed properties to the photograph that only the object itself could have. We see this phenomenon as parallel to that of Piaget's notion of nominal realism in which the child believes that names have properties of the objects they label. The results showed that 80% of the 3-year-olds we tested gave at least 3 iconic realism responses, 30% of the 4-year-olds and 11% of the 5-year-olds. Neither color nor size affected the results.

We interpret these findings as showing that children only gradually discover that the photograph has properties of its own (i.e., it is made of paper,

it tears, etc.) and does not share critical properties with the object it depicts (e.g., has an odor like a flower). At the same time there appears to be a tentativeness about their understanding indicated by the fact that only one child who thought the ice cream cone picture would be wet and cold asked if she could taste it.

A fourth study (Kose, Beilin & O'Connor, 1980) was concerned with the child's ability to respond to the depiction of arrested action in photographs. There were 80 subjects, 3 through 6 years of age, who were asked to imitate the actions depicted in a set of 12 black and white photographs. They were also asked to imitate the actions of a live model and provided a verbal description of the photographs. The actions of the model that were depicted were somewhat unusual but generally within the capabilities of the child (e.g., hands on hips; standing on one foot). Their imitations were rated within a range from 0 to 2. For photograph imitations, 3-year-olds had a mean score of .36, 6-year-olds, 1.86, a significant difference. The live model imitation scores were 1.29 for 3-year-olds and the 6-year-old mean was 1.97, a nonsignificant difference. In respect to verbal descriptions, only 52% of the 3-year-olds could verbally identify actions in the photographs in contrast to 94% of the 6-year-olds. Thus, subjects were extracting more information from the photographs than they could physically imitate, but at 3 years the ability to recognize and identify action information in photographs was far less than was the case at a later age. We were interested to know, further, whether the difficulty in extracting action information from photographs was characteristic of other representations. To test this we asked another group of 3- to 5-year-olds to imitate the actions depicted in line drawings and dolls set in the same poses as the photographs. The imitation of both types of representation (drawing and doll) was superior to that of the photographs, with the imitation of the doll approximating that of the live model. The data of this study indicate that although very young children (within the first year) can recognize objects in photographs, the depiction of action is a more complex form of representation and is only progressively achieved.

The final study to be mentioned (Pazer & Beilin, in preparation) bears on the relation between photographs and a person's developing self-image. Seventy-five subjects at five age levels were studied: 7, 17, 30, 50 and 75 years. Subjects within each age group were acquainted with one another. Five 4 in. by 5 in. black and white photographs were taken of each subject in different profile views. Each subject, a week later, was shown 14 sets of photographs from that person's age cohort as well as those of him or herself and was asked to rank them within sets from the most to least attractive. Each subject was then questioned on the relation of the photograph to his or her own attractiveness. Coefficients of concordance between each subject's ranking of his own photographs and the group's ranking of the subject's photographs for attractiveness ranged from .001 for the 7-year-olds to that of .59 for the 75-year-olds. These data are interpreted as indicative of increasing objective self awareness, in that one's own judgments of attractiveness come into closer accord with others' judgments with increasing age. The reactions of subjects to their own photographs are of particular interest. They show that 93% of the 7-year-old subjects (the youngest) thought their photographs were attractive. Only 53% of the 17-year-olds and 30-year-olds, however, had the same opinions of their photographs, probably indicating greater discrimination in their judgments. Only 13% of the 50-year-olds thought their photographs were attractive, reflecting, it would appear, increasing displeasure with how their

physical features are undergoing change. Most subjects in the 75-year-old group did not think of themselves as attractive any longer; however, 87% of them did think they looked as attractive in photographs as they did in reality.

The studies I have described quite briefly do not exhaust the number in which we are engaged, but they give a flavor of the variety of issues with which we are concerned. Basically our interests range from knowledge of how photographs come to acquire meaning for the developing child, how the photograph enters into a system of personal and social conventions, and what I have not described, how the photograph comes to serve an aesthetic function in the context of the child's understanding.

References

Arnheim, R. On the nature of photography. *Critical Inquiry,* 1974, **1,** 149-161.

Kose, G., Beilin, H. & O'Connor, J. Children's comprehension of actions depicted in photographs. Presented at the Sixth Biennial Southwestern Conference on Human Development, Alexandria, Va., April, 1980.

O'Connor, J. Representation and transitivity. Unpublished doctoral dissertation, City University of New York, 1981.

O'Connor, J., Beilin, H. & Kose, G. The effect of media on logical operations. Presented at the biennial meetings of the Society for Research in Child Development, April, 1981.

Pazer, S. & Beilin, H. The photograph is "me": Effect of photographs on objective self awareness. Submitted for publication.

Snyder, J. Picturing vision. *Critical Inquiry,* 1980, **6,** 499-526.

Sontag, S. *On photography* New York: Farrar, Straus & Giroux, 1977.

Worth, S. Pictures can't say "ain't." *Versus 12,* Proceedings of the International Conference on Semiotics, Milan, 1981.

Harry Beilin
Graduate School and University Center
City University of New York
33 West 42nd Street, New York, N.Y. 10036

PROJECT ZERO: THE EVOLUTION OF VISUAL ARTS RESEARCH DURING THE SEVENTIES

Jessie Lovano-Kerr
Indiana University
Jean Rush
The University of Arizona

Introduction

Aesthetic Education

An artist is a person to whom society often ascribes a certain freedom of spirit, who explores and enjoys the nuances of his or her world, who experiences the satisfaction in creative energy by expressing personal feelings and ideas through the disciplined use of words, paint, clay, music, or other media. Young people who exercise their creative and expressive skills will demonstrate those qualities in all aspects of their adult lives, no matter what their career choices may be. They will recognize and appreciate uniqueness and quality wherever they find it and will become perceptive audiences who enjoy the arts all of their lives. Teaching children to respond aesthetically in creating and appreciating art is generally accepted as a major objective in art education.

Educators have had difficulty in specifying the content necessary for the aesthetic education of children during their early years. The concept of aesthetic education was first shaped at the Whitney Museum Conference in 1967, held jointly with the Rhode Island School of Design and coordinated by Harlan Hoffa and Manuel Barkan. The conference was one of 17 developmental seminars funded between October, 1964 and November, 1966 by the Arts and Humanities Program of the U.S. Office of Education, under the direction of Kathryn Bloom. The emphasis placed on research and deveopment in aesthetic education by Stanley Madeja at CEMREL, Inc., the national education research laboratory in St. Louis; by Kathryn Bloom through the Arts in Education Program of the JDR 3rd Fund; and by Howard Gardner at Harvard's Project Zero are direct outgrowths of this conference that have influenced art education through their years of sustained research, theorizing, and policy statements pertaining to aesthetic education. Their goal was making aesthetics and the arts an essential part of every child's formal education (Bloom, 1977).

Project Zero

One of the early Arts and Humanities grants for research in aesthetic education was awarded in 1966 to Nelson Goodman (*Languages of Art,* 1968) of the Harvard Graduate School of Education. Goodman's final report, "Basic Abilities Required for Understanding and Creation in the Arts" (September, 1972), contained seven technical reports on topics such as arts in alternative schools, the theory of symbols, kinds of musical reference, and the lecture-performance as an instrument for audience education (Murphy & Jones, 1976). Goodman's research generated wide interest among arts educators and began an investigation that has continued throughout the decade of the seventies under the name of Project Zero.

Project Zero, in its fourteenth year, is unique in art education for its focus,

funding, and tenure. When the project began, arts education research was in its infancy. The name was intentionally whimsical. According to the project's codirectors, David N. Perkins (*The Arts and Cognition,* 1977) and Howard Gardner (*The Arts and Human Development,* 1973; *Artful Scribbles,* 1980), "the zero reflected our starting point, our pessimistic estimate of the state of general, communicable knowledge about arts education. The project's aim was to attempt a rational study of artistic activity; from such understanding we hope to devise concrete recommendations for educating keen ears and eyes, creative minds and hands from kindergarten to college" (Perkins & Gardner, 1974, p. 5).

The focus of Project Zero has been the developmental study of artistic growth, central to which was "the ability of persons to use and understand various kinds of symbols. We focused on symbol use not only because of its importance in general cognition, nor even because of its often-neglected role in artistic process; rather, we held a conviction that, through an intensive exploration of such symbolization, fresh insights into the overall educational process might be attained" (Gardner, 1976b). Project Zero's stated research goals were as follows:

> (1) to analyze and classify the types of symbol systems and symbolic reference characteristic of different art forms; (2) to identify and study experimentally the skills and abilities required for the understanding and manipulation of art symbols; and (3) to investigate methods of nurturing and training those abilities generally and as they bear upon particular arts. Although the ultimate goal is improvement in art education, emphasis throughout is on long term, basic research, aiming at clarification of issues, identification of problems, and proposal of hypotheses for testing (Howard, 1971, p. 64).

Project Zero has continued to receive more or less consistent federal funding over the past 10 years from the U.S. Office of Education, the National Science Foundation, and the National Institute of Education, either directly or through subcontracts with CEMREL, Inc. This extended assistance has enabled Gardner and his associates to conduct longitudinal, developmental research as well as a program of sequential, cross-sectional, time-specific studies of such behaviors as children's perception of painting styles or children's understanding of literary metaphor. Project Zero's continuity distinguishes it from its contemporaries in art research, most of whom work on a small scale without support from either the government or their colleagues, an unfortunate situation that results in a generally low and inconsistent output.

Gardner, Goodman, Perkins, and their associates at Project Zero have compiled and disseminated a relatively broad body of work. Project Zero from the beginning has been an interdisciplinary facility. Its spokesmen have constructed a thoughtful, consistent philosophical and psychological framework integrating literature from diverse fields: cognitive, gestalt, and developmental psychology; semiotics; philosophy; education; and the arts. Their mentors include Nelson Goodman, Rudolf Arnheim, Otto Rank, Claude Levi-Strauss, Jean Piaget, and Sigmund Freud. Project Zero's multidisciplinary teams of researchers have asked questions relevant to developmental and to educational processes in the arts, a welcome and innovative effort in both fields. Researchers have consulted the literature in these areas in depth and with considerable insight. They have made applications to the study at hand with a sense of the broad dimensions underlying this new area and with a gift for synthesizing fragments of knowledge into a comprehensive and appealing design for artistic growth.

The numerous publications from Project Zero range in subject from

brain damage and aphasia through the study of symbolic learning, metaphoric behavior, and the perception of artistic style. They constitute a coherent body of material that has shaped the direction of research priorities and policy in aesthetic (arts) education to a prodigious extent over the past 10 years.

The official list of publications from Project Zero for the years 1970-1979 contains 150 articles that have appeared in books and journals, six books written, and three books edited by the personnel associated with the project in either single or multiple authorship. Of the 150 articles, Gardner et al. published 102; Perkins et al., 29; Goodman, Perkins, and Gardner together, 3; and 16 were written by other associates. Gardner alone wrote five books during that period and edited three more in multiple editorship; Perkins edited a book with a colleague. This is indeed an impressive record of scholarly productivity.

Project Zero's own subject classification of the 150 articles show that they cluster around the following topics: brain damage, 32; visual arts, 17; aesthetics, 13; visual perception, 13; metaphor, 12; literary arts, 10; early symbolization, 8; developmental theory, 7; artistic development, 7; Project Zero, 7; arts education, 7; music, 6; miscellaneous theoretical research, 6; creative and problem-solving processes, 3; and miscellaneous experimental research, 3.

Project Zero and Visual Arts Education

The education of visual artists traditionally has been undertaken by artists, and this tradition outdates the investigation of artistic learning by psychologists and educators from other disciplines. Empirical research in the visual arts dates from the end of World War II. All art researchers, including those at Project Zero, have borrowed procedures and philosophical models from allied fields. Some of them have proved appropriate and some cumbersome when applied to the visual arts.

The primary spokesmen for Project Zero hale from outside the profession known as art education. It comes as no surprise, therefore, to hear that their research interests and those of art educators have often overlapped but have not always had the same focus. Because of Project Zero's prominent interest in the visual arts, its unique governmental research support, and its demonstrated influence on visual art education policy during the past 10 years, a brief review of Project Zero's publications that touch on the visual arts may clarify the nature of its contributions, as well as point up the discrepancy between its interests and those of some other art education researchers. Such an examination has not yet appeared in the art education literature.

In this paper we review selected publications by Project Zero personnel. The review will focus on literature related to children's artistic development in four areas: (1) responding to art; (2) making art; (3) symbol use; and (4) cultural influences. We have based our comments on a survey of the literature dealing primarily with normal populations, that treat all of the arts and the visual arts in particular, and on evaluations of Project Zero's progress. This is only about a third of the Project's total publications. We have not dealt extensively with the theoretical or philosophical constructs underlying Project Zero research nor, except in certain particulars, with the careful attempts to articulate broad models of artistic development.

Although Project Zero grew from the work of Nelson Goodman and his philosophical contributions are evident, Howard Gardner has clearly set the pace and direction of Project Zero with his, his associates', and his students' research and the conclusions drawn from them. Gardner's particular

interest in the visual arts is evident by the amount of his published work in this area. The following remarks, therefore, will apply most directly to Gardner's books and articles included in the list of references.

Responding to Art

Thirteen of the surveyed journal articles examine children's responses to viewing a work of art (Gardner, 1970a, 1970b, 1971, 1972a, 1972b, 1972c, 1974; Gardner & Gardner, 1970, 1973; Gardner, Winner, & Kircher, 1975; Rosenstiel, Morison, Silverman, & Gardner, 1978; Silverman, Winner, & Gardner, 1976; Silverman, Winner, Rosenstiel, & Gardner, 1975). This is a sequential series; six of the 13 are progressive empirical research studies that document children's sensitivity to painting style, children's conceptions of the arts, their development of critical judgment, and the role of texture in picture perception. This research has led Project Zero researchers to construct a cohesive view of children's developing visual capabilities when confronting complex figures such as artworks and to identify features of the processes involved. Although the first study simply attempted to ascertain children's classificatory behavior and degree of flexibility at varying developmental levels, questions raised there led to the formulation of subsequent experimental tasks that explored the effects of training on style sensitivity. This depth of focus is unique in art education research and deserves our commendation for setting an example of continuity, productivity, and contribution to our knowledge of children's artistic behavior.

Style Sensitivity

To assign a painting to an artist on the basis of style, a viewer must recognize certain properties or dimensions that the works of one artist have in common. Since each painting is an intricate entity containing a distinct pattern of relationships between its elements, verbalization of style dimensions often inadequately describes the visual experience (cf. Arnheim, 1969; Schapiro, 1972). Some researchers independent of Project Zero have suggested that adults and children can learn to make successful style judgments (Bengston, Schoeller, & Cohen, 1979; DePorter & Kavanaugh, 1979; Rush, 1979; Tighe, 1968; Walk, 1967; Walk, Karusaitis, Lebowitz, & Falbo, 1971), but most have studied adults and none has pursued the matter so consistently as Gardner and his associates.

Gardner operationalized style sensitivity as "the ability to group together works produced by one artist" (1972c, p. 326). Most of the tasks required children to sort picture-postcard-sized reproductions of paintings or, on one occasion, to view slides made from these reproductions. Sensitivity was measured by children's ability to choose an example of a painter's work from an array of four reproductions, one of which was by the target artist and three by other painters; or children were asked to pair two pictures by one artist despite misleading cues. Subjects were upper to lower middle class children enrolled in schools in the suburban Boston area.

In his first study Gardner (1970a) tested 20 first-graders (6-year-olds), 20 third-graders (8-year-olds), 20 sixth-graders (11/12-year-olds), and 20 ninth-graders (14-year-olds) to determine their sensitivity to individual painting style. Gardner trained the children to observe two works by one artist and then to choose one work by the same artist contained in an array of four reproductions. For testing, children repeated this task 20 times, receiving reinforcement or corrective feedback on four of the early trials. By his choice of reproductions Gardner attempted to

determine whether subject matter would provide a miscue. Five arrays contained no recognizable subject matter (abstractions), five contained homogeneous subject matter (portraits of individuals), and 10 contained heterogeneous subject matter.

When subject matter was either controlled (portraits) or absent (abstractions), children of all ages sorted by style. However, the adolescent children (ninth-graders) displayed significantly more sensitivity than all of the preadolescents on items containing a variety of subjects; younger children were misled by details of the subject and mistook them for style cues. Gardner observed that the ninth-graders may have profited from prior exposure to art and that the younger children may have misinterpreted the task. He acknowledged that the older children performed better because they already had a concept of *style* as features unique to the work of one individual, but initially he ascribed this to developmental changes occurring between the sixth and ninth grades.

Since first- and sixth-graders were equally misled by various subject matter miscues in the beginning study, Gardner modified the original task in a subsequent experiment with first-graders (6-year-olds) and sixth-graders (12-year-olds). To minimize the misleading effects of subject matter, Gardner added one test in which children identified the original stimulus cards turned upside down, and one in which they used the original cards from which he had removed misleading examples during training; children viewed the more typical work of each artist, instead of two works as they had before. The younger and older children again displayed similar difficulty with subject miscues on the original task. The sixth-graders, however, demonstrated significantly more style sensitivity than the first-graders in the two modified conditions. Sixth-grade girls outperformed boys, replicating a finding seen in the first study with that age group. Gardner concluded that the modifications drew the children's attention away from the subject matter and improved their focus on features germaine to style recognition such as color, texture, and composition. Gardner ascribed the superior performance of the older children, especially the girls, to developmental changes associated with the start of adolescence.

Gardner and Gardner (1970) then reexamined style sensitivity on a task containing deliberate subject miscues. Working with first-graders (6-year-olds), sixth-graders (11-year-olds), and college sophomores (19-year-olds), they asked subjects to sort cards containing four painting reproductions, two by one artist and two by a second. Each pair by each artist contained the same subject matter. In the first task subjects were to group together the cards that they found most similar; in the second they were to group the cards according to artist (by style). Students of all ages successfully grouped by subject matter, a strategy that the authors interpreted as the more natural tendency and the tendency more reinforced by cultural factors. The youngest children again were unable to ignore subject matter when instructed to group according to artist (painting style). The ability of older subjects to sort by style was taken to indicate

> their felxibility, alertness to instructions, and awareness that a person may leave consistent traces throughout his works even though manifest subjects matter and figure are basically altered. Apparently the youngest subjects are lacking in one or more of these capacities. The initial study did indicate that when subject matter was not available as a miscue, young subjects responded much like older ones. Thus it is conceivable that younger subjects have the potential to perceive style but that they are impeded by their proclivity toward noting subject matter and deeming it a sufficient (or even a necessary) basis

> for classification. In addition, instructions referring to works by a painter may well be devoid of meaning for young children; in efforts currently underway to train children to sort by style rather than by dominant figure, verbal instructions have been avoided (p. 15).

No sex differences were noted at any age level.

Gardner (1972a) then set out to determine whether second-graders (7-year-olds) and fifth-graders (10-year-olds) could learn to sort painting reproductions successfully according to style despite misleading subject matter cues. Gardner hypothesized that either younger children performed less well than older ones because of a deficit in operational thinking, in which case a training program would be ineffective, or younger children had difficulty making use of information already at their disposal, in which case training might reveal considerable style sensitivity.

Children sorted sets of four painting reproductions, two by one artist and two by another. Each set of four contained two pairs, each pair having one painting by each artist that shared obvious subject matter (figural properties). The sets were controlled to minimize other cues based on color, size, medium, etc. Children received, at weekly intervals, a pretest, seven sessions of unspecified length to practice sorting paintings either by subject or by style, a repetition of the pretest as a posttest, and then a repetition of the posttest with instructions to sort according to the alternate criterion. The younger children also took four of Piaget's tests of concrete operational thought.

Training produced a high level of sensitivity in both age groups, although the fifth-graders performed significantly better than the second-graders. Concrete operations appeared unnecessary for stylistic sensitivity among the younger children, most of whom sorted well by style but had not yet reached the stage of concrete operations. No performance differences occurred that were related to the sex of the participants. The criterion reversal test revealed that older children who learned to sort by subject matter also could sort by style as well as those trained to do so, but that the first-graders could not.

Gardner concluded that "style sensitivity may be more closely related to discrimination learning or to the discovery of distinctive features than to class inclusion or conservation" (p. 613). He noted that "a training paradigm can alter the basis on which [children] group works of art" (p. 614), and he continued to surmise that the superior performance of the older children appeared due to "the developmental changes which occur during the pre-adolescent period" (p. 614).

The training study allowed Gardner to observe that the strategies used in style sorting focused "on the material within the picture, disregard[ed] the most obvious figural aspects, and attend[ed] to corrections" (p. 613). Global impressions seemed important, and texture appeared to be a significant style cue, a finding that Gardner later confirmed experimentally (1972b). Gardner hypothesized (after Lorenz, 1966) that "pre-adolescents can form Gestalten for certain artists, styles, or textures" (p. 613) by focusing on the essential attributes of a class of stimuli.

Gardner distinguished in particular between sensitivity to objects and sensitivity to persons.

> Until middle childhood, sensitivity to objects appears to dominate over sensitivity to persons, regardless of the nature of the instructions or task.... one can classify *consistently* by style (rather than by subject matter or dominant figure) only when one is, in some sense, aware that a person can leave traces of his own behavior in a variety of places and ways. I also propose that response to aesthetic objects rests in

part on the knowledge that they were made by, and expressive of, individuals (Gardner, 1971, pp. 519-520).

A subsequent training study by Silverman, Winner, Rosenstiel, and Gardner (1975) sought "to determine the steps through which children pass in learning to sort paintings by style" (p. 373) and to examine the effect of style learning on drawing. Assuming that preadolescent children are characteristically insensitive to stylistic properties without training, the authors confronted the question of how style sensitivity might relate to other cognitive, perceptual, and artistic capacities. A secondary investigation concerned whether or not a concept of style is best acquired by seeing a broad range of periods and artists or by seeing fewer periods and artists but more examples of each.

After an initial pretest to determine style sensitivity and drawing ability, four groups of fifth-grade children (10-year-olds) received the following treatments: two groups learned to sort painting reproductions according to style of individual artist, one by looking at a wide number of artists and periods (extensive training) and one by looking at a limited number (intensive training); one group learned to recognize pictures of closely related animals; a control group received no training at all. Following treatments, all children took an extensive and an intensive style-sensitivity posttest using Western painting reproductions similar to those used in training; a posttest classifying animal pictures; a style-sensitivity posttest using non-Western painting reproductions; and a drawing test.

On the *extensive* posttest both the intensive-trained and the extensive-trained children recognized individual painting styles significantly better than the animal-trained and control-group children, with girls performing better than boys. There was no significant performance difference between the extensive and intensive training groups, and members of the animal training group performed only minimally better than children used as controls. On the *intensive* posttest, however, the intensive-trained children were more sensitive to style than were children in any of the other groups, indicating that "intensive training with a few salient painting styles emerges as a more potent regimen than training with a wide variety of styles" (p. 378). Some changes were seen in posttest drawings produced by children who studied painting styles, chiefly in more varied use of texture, color effects, and use of light and shadow, although the results here were not particularly strong. One reason might be the confusion reported among the children concerning observed differences between "the small untextured reproductions used in the study and actual paintings" (p. 380).

Responding to Art: Some Critical Observations

Gardner's reports of these first four style studies emphasize developmental patterns, an interpretation of the data that, we suggest, may profit from further scrutiny. Certain effects ascribed to developmental changes actually may be due to the influence of research methodology, such as the tasks or training used, the kind and use of visual stimuli, and method of eliciting children's verbal responses; or to the effects of environmental factors, such as children's cultural backgrounds, exposure to mass media, or formal education.

Training. The first study on style (Gardner, 1970a) suggested that young children, but not older ones, characteristically classify paintings according to subject rather than style, a conclusion stated as an axiom in most of Gardner's subsequent work. This age group later overcame that tendency as a result of training (Gardner, 1972a).

Since we know that untrained adults, although capable of style distinctions, recognize individual styles only after training (Rush, 1979), and that subject matter also poses misleading cues for adolescents (Gardner, 1974), lack of sensitivity to style seems consistent in all untrained subjects despite age. Concluding that young children's sorting preferences for subject matter differ in any respect from adults' preferences, or that these preferences are a developmental phenomenon, appears unwarranted on the basis of Gardner's own research. Despite evidence to the contrary, the assumption that young children are insensitive to style continues to figure conspicuously in Gardner's recent work.

It seems likely that the so-called insensitivity of the younger children in Gardner's early studies, particularly the first three, resulted from the fact that they were operating without the benefit of training. In the first study (Gardner, 1970a), children examined two examples of one artist's work before selecting a third on the basis of style, and they received feedback during the early part of the test. Given later findings that young children performed well with more adequate training, it might be said that the first study used an inefficient training paradigm that penalized younger, less experienced subjects by allowing the prior education of older children, whether formal or informal, to influence the results. Style concepts are learned by seeing examples, and, as Silverman and her associates (1975) suggested, learned best by exposure to many examples of the same style (intensive training). Style training in the initial study was ineffective also in the sense that, as Gardner observed, the younger children did not possess the concept of *style* as features unique to one individual.

All of the first three studies (Gardner, 1970a, 1970b; Gardner & Gardner, 1970) are deficient in these same areas. In Gardner's 1972a training experiment, on the other hand, young children learned both the concept of *style* and concepts of individual painting styles. The criterion reversal test suggested that the experience of older children remained an advantage in this condition, since training in the alternative way of sorting was minimal.

Given this evidence of the variable effects of training, developmental interpretation of these data seems ill advised until training paradigms have been refined so that their influence may be identified and sifted out. Gardner, however, has constructed later experiments around developmental hypotheses derived from these four studies, apparently with little critical evaluation of his research design even when confronted by his own data. Subsequent work has failed to come to grips with this essential defect.

Visual Stimuli. The visual stimuli used in all of the style studies, with the possible exception of those in the study on children's conceptions of the arts (Gardner et al., 1975), have been 3x5-inch color reproductions of paintings. Their limitations also may have affected children's performance on style recognition tasks. Calling these reproductions *paintings,* for example, may have caused some misunderstanding on the part of the children to whom they were shown. Silverman et al. (1975) reported that many children "seemed confused about the difference between the small untextured reproductions used in the study and actual paintings" (p. 30), but that their confusion subsided as training progressed. Although this issue is not discussed anywhere in the Project Zero literature reviewed, in reporting the results of all of the studies the authors frequently refer to the stimuli as paintings, an inaccurate use of the word confusing to their readers as well as to their experimental subjects. It is conceivable that children in all of the studies from 1970 on, expecially the

younger ones, misunderstood this misleading term. Older children could be expected to know that the painting to which the experimenter referred was a much larger real object represented by the 3x5 reproduction used in the identification task. Younger children apparently had difficulty making the distinction. In Project Zero's recent study of critical judgment (Rosenstiel, Morrison, Silverman, & Gardner, 1978) a third-grader, observing the 3x5 picture, remarked "it's hard to paint things so small" (p. 100).

An example of the ambiguity that these mislabeled reproductions caused occurs in the later study of children's conceptions of the arts. Gardner, Winner, and Kircher (1975) reported that the youngest group, "When presented with a painting and asked to explain where it came from" (p. 65), answered "the factory, . . . a store, a book, a school, a camera" (p. 65). All of these responses describe reproductions. The authors, however, considered them to be immature and concluded that "the human origin of a painting was not apparent to these children" (p. 65), and that they had "fundamental misconceptions about art" (p. 64). Whether the children viewed reproductions or actual paintings is unclear, since the authors cited prior studies in which the term painting had been used consistently to refer to reproductions. The authors stated that young children have "succeeded in . . . grouping paintings by style" (p. 60) and that a "young child who can look closely at two Impressionist paintings and detect fine textural differences between a Renoir and a Bonnard [a reference to postcard-sized-reproductions] may reveal, when questioned, startling misconceptions about what a work of art is, how it is made, or what distinguishes it from a machine-made or a natural object" (p. 60). If Gardner et al. used reproductions, they misinterpreted the children's answers; if they used real paintings, their inaccurate use of language obscured that important information.

In addition one must question the meaning of children's responses to reproductions as small as 3x5 inches and the validity of generalizing from them to responses that would be generated by a real artwork. Visual quality suffers in any small reproduction, and the size disparity between Gardner's stimuli and most real paintings is large. Evidence of these visual misinterpretations suggests a weakness in the early works needing further interpretation and correction. Children's responses on future tasks assessing aesthetic qualities might differ if investigators were to employ real paintings or, at least, high quality color slides projected close to actual size.

The study comparing intensive and extensive training (Silverman et al., 1975) touched on yet another facet of style recognition and stimulus use without identifying it as such. Some paintings are more typical of a style than others, that is, they contain more style information. Paintings from one artist (Picasso) vary along this dimension as well as paintings from one cultural style (Cubism). Adults have greater difficulty in recognizing some works that others (Rush & Sabers, Note 1), which suggests that the examples selected can facilitate or hinder style learning. Project Zero researchers mentioned this variable but neither attempted to control it nor discussed it as a possible source of error.

Prior Experience. Project Zero researchers seldom mention either the educational environment of its subjects or the findings of other research on the efficacy of teaching in the visual arts. The study of children's conceptions of the arts (Gardner et al., 1975) is such a case. Gardner and his associates showed children a work of visual art (whether real or reproduced is unclear), read them a poem, or played

them recorded music. Interviewers then asked the children questions designed to elicit unbiased answers, such as "Where did it come from? What else might you call it? Did you like it?" (p. 62) and stressed to the children that there were no right or wrong responses.

By questioning 121 children ranging from 4 to 16 years of age, the authors identified broad patterns or stages of thought at three age levels. "There was a set of 'immature' responses found among 54 four- to seven-year-olds, another set of 'intermediate' or 'transitional' responses found among the 58 eight- to twelve-year-olds, and a final set of 'mature' responses found among the 16 fourteen- to sixteen-year-olds. The authors view[ed] each set of responses as representing a certain cognitive stage and as having certain basic characteristics or properties" (Rosario, 1977, p. 93). Gardner et al. identified these stages of thought as neither taught nor imitated, but considered them spontaneous constructions at certain developmental levels. Because of the consistency of subject responses to specific questions, they concluded that there is a "substantial universal component in children's artistic conception" (p. 75).

This conclusion ignores possible effects of the children's experience (or lack of it). Gardner and his associates recognized that children's conceptions of the arts may not reflect "the way in which they think about the world in general" (p. 74) because the arts "pose problems which seem to be non-generalizable ones" (p. 74), such as diverse media, each with its own characteristics; the contrast between children's lack of direct fine arts experiences and their greater familiarity with the physical and moral universe; art experiences mediated by mass technology; parental prejudices about art as either elitist or recreational; and the prevalent bias among untrained adults that the arts are too sophisticated and therefore beyond understanding. Nowhere do the authors address these issues.

Formal education is bound to influence children's responses in research situations. Unlike academic subjects, art as a course of study is inconsistent. Recognition of this fluctuation of prior art experiences is crucial to interpret any data on artistic development. Older children, for example, gave responses that implied personal acquaintance with art concepts and skills that could reflect training under an art specialist, a typical learning situation in junior and senior high schools. At the elementary level, however, most art experiences are designed and taught by classroom teachers who have limited art background. Since few art textbooks or mandated curricula are used in the elementary school, there is little content or pedagogical consistency across elementary school populations. The youngest subjects in this study, therefore, may have had less exposure to art than the older children. Artistic development should be considered in terms of the opportunities a child has to learn.

Rosario (1977) critiqued the study on children's conceptions of the arts from an ethnomethodological point of view. Rosario also doubted that the data allowed Gardner et al. to infer the existence of congitive stages, let alone whether they are spontaneous constructions. He pointed out that the study was designed not to collect data on *how* children acquire knowledge of the arts but, rather, to investigate *what* children think about the arts. Rosario examined the questions used in the interviewing process from the perspective of how the children might have interpreted them. He noted that Gardner's questions "Where do you think it came from?" and "How do you think it was made?" implied

possible *locations* and *processes of reproduction.* Thus, if the children in Gardner's youngest group gave responses

such as 'factory,' 'store,' 'school,' or 'you pick up a crayon and draw,' it is a questionable claim that these children exhibited 'misconceptions' as to the identity and production of works of art. The children's responses fall within a range of conceivable answers, and if we take into account what is implicit in the questions, they do make sense . . . To conclude, on the basis of the responses alone, that the selections are functions of a cognitive stage of development is unwarranted, to say the least (p. 98).

Rosario suggested that Project Zero investigators assumed children were correctly interpreting their questions, and as a result they expected them to demonstrate the same kind of responses adults would give; when they didn't, their answers were labeled misconceptions.

The final Project Zero documentation of children's responses to art describes the development of critical judgment in the visual arts (Rosenstiel, Morrison, Silverman, & Gardner, 1978). Interviewers questioned first-, third-, sixth-, and tenth-graders to determine the extent to which children of different ages can distinguish among standards of personal preference, community values, and technical competence applied to painting reproductions. This study exhibits most of the characteristics of the study on children's conceptions of the arts and, therefore, contains defects similar to those we have already described regarding the nature of the questions and stimuli used, their interpretations by various age groups, and the leap from data to developmental inferences and pedagogical recommendations. First-graders, for example, had difficulty discriminating differences among the three kinds of questions, which suggests some misunderstanding.

Most art criticism models stress a broader range of analyses and a more objective approach than that used by Project Zero. They begin with observing surface qualities of artworks and proceed to analyzing and interpreting formal aspects and, finally, to evaluating or making critical judgments. Hickey (Note 2) used Feldman's model to determine whether children aged five to fourteen had the perceptual and conceptual abilities necessary to respond appropriately within each category (Description, Formal Analysis, Interpretation, and Evaluation). Hickey derived her list of perceptual and cognitive abilities from the research of Piaget, Bruner, Arnheim, and Werner. She found that children with no prior training in art appreciation or art criticism possessed these abilities in varying degrees at different developmental levels. Hickey also found that levels of development were independent of age.

These results and conclusions contrast with those of Rosenstiel et al., who suggest a developmental pattern and who believe that their study provides normative developmental information with educational implications. Answering the questions on personal preference, community values, and technical competence is different from making critical judgments; yet Rosenstiel et al. generalize from the former to the latter. Their rationale here seems tenuous when compared to other serious efforts in the same area.

Making Art

Several of the Project Zero publications reviewed dealt with the artistic process in the sense of creating visual art (Carothers & Gardner, 1979; Gardner, 1980; Rosenstiel & Gardner, 1977; Silverman, Winner, Rosenstiel, & Gardner, 1975; Wolf & Gardner, Note 3). Proect Zero's investigation into the creative process is more recent and the research literature therefore less comprehensive than that on style sensitivity.

The focus of Project Zero on children's creative growth reflects Gardner's developmental orientation. In *Artful Scribbles* (1980), for example,

Gardner offers a picture of graphic development similar to others' observations of children's drawing (e.g., Golomb, 1977; Goodnow, 1977; Kellogg, 1969; Lowenfeld, 1947), i.e., proceeding from scribbles, through mandalas, to the systematic depiction of entities (tadpole figures) and the subsequent increase of expressiveness and complexity that may continue, in some cases, throughout adolescence into adulthood. Gardner believes that this pattern is common to children of all cultures and that intervention can speed up or slow down the developmental process, but cannot qualitatively alter the basic developmental sequence.

Although Gardner's work is significant within the context of aesthetic education as well as artistic development, these two areas are not synonymous. Gardner prefers basic research (Gardner, 1977) leading to "a definition of the 'end state' of artistic competence [and] an outline of developmental stages culminating in such competence" (p. 31).

Art education researchers, on the other hand, are apt to value the effects on the developing child wrought by experience, especially in the perceptual and motor skills peculiar to the creative process in the visual arts. Educators strive to implement the aesthetic development of individuals of all ages. In their view, understanding developmental patterns may prevent inappropriate intervention, but does not obviate the need to organize effective experiential patterns to implement, enhance, or perhaps even alter growth. Gardner's education goal in not "to 'speed up' attainment of competency, but rather to make available to an individual the fullest set of examples, problems, and themes for which he will be searching at a particular stage in development" (Gardner, 1977, p. 34). If a person without language instruction may develop into an illiterate, a person without visual arts instruction may grow into a visual illiterate. Both camps apparently believe that without opportunities to exercise creativity, a child may become an adult whose developmental potential is unrealized (cf. McFee, 1970).

In *Artful Scribbles* Gardner has verbally and visually examined the characteristic graphic images that children make, from their first manipulation of marking tools through adolescence. He relates these manifestations to other developmental traits, thereby elucidating visual artistic expression as representative childhood behavior. Gardner's studies overlap both education and psychology, and the success of his publication indicates that many practitioners in each field are unread in the basic literature of the other. Gardner correctly sees this mutual ignorance as a stumbling block for both art and psychology researchers.

Gardner seldom cites the art education literature on either creating or responding to art, although a considerable amount exists that is related to his work, some of it quite sophisticated. As a result Gardner appears either unaware of or disinterested in many contemporary issues in the profession. Children's artistic growth has been discussed frequently during the past 10 years in art education literature. Studies documenting the positive effects of instruction on the art performance of children as young as two years (Douglas & Schwartz, 1967; Dubin, 1946; Kannegieter, 1971) present a different viewpoint from Gardner, who regards the natural unfolding of artistic development as inviolable (Gardner, 1976b) and who implies that intervention is a negative influence.

Gardner and his colleagues (Silverman et al., 1975), in fact, have noted positive effects of style learning on children's drawings in such formal aspects as color and texture use. Rosenstiel and Gardner (1977) studied first-, third-, sixth-, and tenth-graders'

performance on a drawing task to ascertain whether an observed decline in artistic skills during childhood might be due to the advent of formal mental operations in adolescents, specifically the increase in their critical capabilities. Rosenstiel and Gardner found that older children who viewed more proficient drawings upon completion of their own first drawing took more care on their second. Older children often evaluated their own drawings in a negative way, even though their competency (skill level) increased with age. The authors suggested that preadolescents "do not receive sufficient introduction to the practice of constructive criticism, and that the 'sudden outbreak' of critical awareness cripples their productive output. Should this be so, it would seem advisable to develop exercises which would introduce subjects gently to the practice of criticism" (p. 42). Yet, because of the judged decline in flavorfulness during adolescence, observed also in two earlier studies of children's sensitivity to musical styles and children's literary skills (Gardner, 1973b; Gardner & Gardner, 1971), the authors hypothesized that "artistic sensitivity may attain a high point in our society in the preadolescent years" (p. 42). This conclusion may be premature given the arbitrary nature of the criterion (flavorfulness), the training effects observed in the study, and the little evidence to demonstrate that behaviors characteristic of one art form will generalize to another.

Making Art: Some Critical Observations

Studies on artistic process are of great interest to art educators, who are above all committed to the process they teach. The core of visual arts education is art. Most adults in our society, uneducated in the visual arts, remain visually insensitive to some degree to the formal relationships in a work of art. This visual illiteracy apparently has no relation to their intelligence or educational level, although it often affects their preferences for certain art objects. Many psychologists who have studied the visual arts have displayed a lack of sensitivity to the visual material with which they dealt; this impairment has affected the design of their experiments and the conclusions drawn from them. The study published recently in *Developmental Psychology* by Carothers and Gardner entitled "When Children's Drawings Become Art: The Emergence of Aesthetic Production and Perception" (1979) has certain weaknesses in this respect.

In this experiment children completed drawings that varied along two dimensions, syntactic repleteness and expression (metaphorical exemplification), two of four characteristics identified by Goodman (1968) as observable in aesthetic works. The children later identified correct completions of the same drawings provided by the experimenter. Carothers and Gardner measured repleteness according to the quality of line used to indicate the contour of a form within a picture (thick *vs.* thin lines, termed brightness; varied thickness *vs.* uniform thickness of lines), and the kind of lines used to indicate shading of a form within a picture (horizontal bars *vs.* crosshatching). They measured expression according to whether an entire picture expressed (as contrasted to *represented*) either the emotion of happiness or sadness.

Carothers and Gardner pointed out in their introduction that "although all drawing occurs in an artistic medium, not all drawings make use of the fundamental aesthetic characteristics of the medium and, therefore, not all drawings are necessarily works of art" (p. 570). They graphically described a replete line as one providing "the outline of Mount Fujiyama, with every variation in thickness, bright-

ness, and shading relevant to its interpretation'' (p. 571), and they recognized that a drawing of a person who looks sad ''need not express sadness; such an expression may instead be conveyed by the use of certain colors (often dark), properties of line (drooping), and the like'' (p. 571).

Unfortunately, Carothers and Gardner used visual materials in their experiment that exemplified few of their verbal observations. They elicited children's production or perception of repleteness by using drawings in which the lines were not replete. The lines did not vary in thickness or thinness in response to the contour that they depicted, but were merely thick or thin, varied or uniform, with no concern for requirements of the visual statement. The examples of shading exhibited the same mistakes, and in addition provided other misleading cues, e.g., not all bars in the pictures modeling horizontal bars were horizontal; some were vertical and some, oblique. The drawings that modeled expression actually *represented* an emotion of happiness or sadness through what may be called the literary or symbolic aspect, so that the sun shone in a cloudless sky in the happy picture, but in the sad picture the sky was filled with dark clouds. Neither the happy nor the sad picture expressed an emotional content through any of the formal elements such as line, color, compositional variety, or so on.

All of the drawings used in Carothers's and Gardner's experiment employed obvious visual stereotypes. None was a work of adult art and none was an authentic child's drawing. All were noticeably lacking in aesthetic quality. If repleteness and expression were present in these drawings, as indicated by the authors, they cannot be symptomatic of aesthetic quality. On the other hand, if repleteness and expression were not present, the drawings were inappropriate stimuli for the experiment described.

Symbol Use

Symbol development and use by the young child has been a central interest of Project Zero from the onset; the three visual arts studies on this subject have been undertaken fairly recently, however. Whereas the earlier series of cross-sectional studies on style sensitivity progressively changed experimental treatments, the studies on symbol formation used the same experimental tasks for different populations (infancy to fifth grade) within both cross-sectional and longitudinal structures. The first, a longitudinal study of five first-born infants, is still in progress and results are unavailable (Gardner, Wolf, & Smith, 1975). The second is a cross-sectional study of nursery school children aged 2½ to 5 (Gardner, 1976a). The third is a combined cross-sectional, longitudinal study of children initially aged 5 to 8, who were subsequently retested for two more years (Ives, Silverman, Kelly, & Gardner, 1979).

The common core of inquiry in the two completed symbol-development studies consists of five related issues: simultaneity of symbol system emergence; the order of emergence and the differences and factors involved; the universality of stages in symbol system mastery; the factors involved in observed wide differences in symbol skill and preferences; and methodological issues regarding the identification of specific process behaviors (Gardner, 1976a).

Each child performed four tasks for each of three symbol media (language, drawing, and clay), with the addition of a symbolic play task for children aged 2½ to 5. Each child produced a spontaneous product, completed a work left incomplete by the experimenter, assembled a work from several parts, and produced ''as faithfully as possible a work or performance exhibited by the experimenter'' (Gardner et al., 1975, p. 15). The spontane-

ous tasks were repeated for two more years with children who were initially tested in kindergarten, first, and third grades (Ives et al., 1979).

There were five general findings for the nursery school (2½- to 5-year-old) children (Gardner, 1976a): (1) tremendous individual differences within age groups; (2) sex differences in media and symbol use; (3) an improvement with age in overall flexibility; (4) an understanding of media, task situation, and the capacity to elaborate; and (5) a characteristic approach to tasks. The copying task produced the most anxiety, while the assembly task produced the least. Fixed themes in children's drawings also were noted, such as Batman, the Yellow Submarine, and Oscar the Grouch. Speculation regarding this phenomenon was two-pronged: on the one hand, the return to a familiar theme could represent a necessary element in artistic growth, since variations could be explored; on the other hand, fixed themes could be inhibiting for some children, preventing further explorations and changes. The origins of the fixed themes were not discussed by the authors. Perhaps the strong influence of popular culture on children at very early ages is a given and, therefore, assumed to be implicit in artistic performance.

Gardner (1976a) drew implications from the study of nursery school children in relation to the five focal issues previously identified. He found that a child's symbol system often did not develop simultaneously. Moreover, each level of symbol use seemed to be contingent on certain prerequisites, which, once fulfilled, generalized across a variety of media. No fixed order of symbol emergence was evident, and mastery of individual symbol systems appeared to differ noticeably among children. Some showed very advanced verbal abilities while others of the same age seemed to prefer the visual and design features of media such as drawing. These striking differences were found among children as young as two and three years old.

Patterns of consistent behavior among individual children, however, were noted across tasks. Assessment of commonalities and individual differences found in this study required the combining of two divergent psychological constructs, the cognitive and the affective. Accordingly, children's products, evaluated for technical competence, were categorized on the basis of developmental level or mental age, reflecting the view of the cognitivist. The affective approach was used to assess the distinctive qualities of children's products and performance.

Gardner (1976a) proposed the concept of cognitive style to account for "the particular way in which each child realizes the universal properties of symbolization at his level of development" (p. 18). Specifically, cognitive style referred to patterns of symbolization behavior of children described in somewhat dichotomous terms. Children identified as *verbalizers* tended to talk more than to produce art works; their counterparts, *visualizers,* were active producers and were reluctant to talk. *Self-starters* approached tasks effortlessly; *completers* exhibited anxiety when first starting a task, but not when the task required completion only. The *person-centered* child was more socially oriented and focused on communication and used figures in graphic expression; the *object-centered* child was more private and tended to draw objects (physical elements, machines). Gardner used the concept of cognitive style to reconcile differences between universal development stages and individual behaviors when confronted with evidence from the nursery school study that revealed strikingly individual uses of symbol and media by young children at the same age and level of skill. The examination of the relation between cog-

nitive style and symbol formation and use, if extended longitudinally from preschool through the elementary and secondary levels, could be a major contribution to the literature on artistic development and a valuable extension of Gardner's developmental model.

A move in this direction seems to appear in the third study on symbol development of 45 children from kindergarten, first, and third grades (Ives et al., 1979). The content and format of these experimental tasks were identical to those administered to preschoolers, except for the elimination of symbolic play and the addition of a retest situation in which the same subjects completed the spontaneous product tasks for two more years. Each product was assessed on the basis of competence (skill level), flavorfulness (elaborative and expressive use of elements) and uniqueness (unusual arrangements and embellishments).

Symbolic competence increased witn age; the rate was not the same for all ages, however. Different developmental patterns appeared in each art form. Competence, uniqueness, and flavorfulness in storytelling increased steadily from kindergarten to fourth grade, showing a slight decline at fifth grade. This pattern was not found in drawing and clay, where competence, uniqueness, and flavorfulness increased from kindergarten to first grade and then declined in third, fourth, and fifth grades with the exception of drawing flavorfulness, which rose slightly again at the fifth grade level. As might be expected, the level of self-confidence was consistent with these patterns. Initially more enthusiasm was exhibited on nonlinguistic tasks, but the level of enthusiasm for linguistic tasks rose steadily from kindergarten to third grade, where children were more enthused with storytelling than with drawing and clay. Storytelling competence correlated significantly with the children's Stanford achievement scores; no correlation appeared between achievement scores and competence in drawing and clay. The authors rejected the notion of a unified semiotic function and concluded that "development in drawing and clay reaches a peak around first grade and then begins to decline as children proceed through elementary school and acquire concrete operational thinking" (p. 11).

Symbol Use: Some Critical Observations

In the symbol-development studies, mention is made of the general reliance on language for communication at the elementary level in contrast to the limited use of visual art forms as vehicles for communication, although this observation is not reflected in the conclusions drawn by Gardner and his associates. Yet, these and other effects of educational experiences permeate every experimental task. The development of language skills is an important aspect of formal education; language skills and, hence, confidence are expected to increase with age and grade. This expectation has been verified in Gardner's studies of symbol development.

Conversely, the development of art skills is not a major goal in general education. Curriculum development lags far behind that of other subject areas. Results of Gardner's symbol-development studies reflect this discontinuity, where the lack of progressive development in art skills contrasts greatly with the progressive skill development in language. Any analysis of artistic development should account for major effects of education and prior experiences. Experimental results will always vary in accordance to the opportunity children have to develop art skills, as indicated in a number of studies on this topic (Brouch, 1971; Gilliatt, 1980; Grossman, 1970; Seefeldt, 1979; Wilson, 1966). In the absence of a standard-

ized curriculum, even junior and senior high school art programs are uniquely and individually designed. Without such continuity and sequence as appears in academic subjects, caution is called for when making inferences about developmental levels of artistic growth.

Also absent from the studies on symbol development, as well as from earlier studies on aspects of artistic development, is reference to related theories and research in art education. In particular, no mention is made of June King McFee's Perception-Delineation (P-D) Theory (1970; McFee & Degge, 1977), well-known in art education and used frequently as the basis for inquiry into variables influencing children's artistic development. This organismic theory synthesizes elements of many disciplines, among them Gestalt psychology, association theory, and cultural anthropology. This integrative aspect and, in particular, some of the postulates accounting for individual differences in McFee's P-D Theory, are also found in the writings of Gardner (i.e., cognitive styles). McFee, however, includes variables involved in the effects of prior experiences and education on creating artistic symbols and responding to the aesthetic properties of art objects.

Cultural Influences

As the sphere of Gardner's research widens, so does his perspective on factors influencing artistic development. Since the standard developmental framework assumes culture to be a relatively fixed variable, a recent manuscript by Ives and Gardner (Note 4) departs from the traditional stance by viewing culture as a dynamic and constantly changing set of influences that effect children of diverse ages in different ways. They also differ in their sensitivity "to the particular symbolic medium in which knowledge is captured and conveyed" (p. 5). Their research has verified that "the use of different media and their underlying systems involved different mental operations" (p. 5).

Ives and Gardner have attempted to identify developmental trends of artistic symbolization common to all children. Universal patterns in drawings are ascribed to the very young. Characteristic schemes are identified at each age level from two to four with a continuation through the fifth year. According to the authors, cultural influences become increasingly more evident in drawings after age five, peaking between seven and 12 years of age. Although older children are fluent in symbolic capacity, there is a "latency stage" as they come to draw less, or not at all. Ives and Gardner identify the probable cause as a move toward visual realism and the frustration children experience when their renderings fall short of their expectations. They noted a continual decline in artistry, especially during the adolescent years, apparently associated with the rise in critical faculties of the adolescent.

The authors recognized the limitations of their overview, since much of the survey was "speculative and programmatic rather than summative and conclusive" (p. 24). They are confident "that individual predispositions, genetic potentials, and cultural influences should interact in ways which can in principle be specified" (p. 24), although we are still far from knowing what these will be. This is a welcome departure from a methodological limitation of most of the Project Zero research, their lack of heterogeneous experimental samples. The great majority of the children studied over the past 10 years were drawn from middle class suburban schools, a selective population that in no way reflects the cultural mix prevalent in many of our public schools. Since the theoretical model that has grown from Gardner's research may be applied in other cul-

tures, its underlying limitations could lead users to believe that differences among children who are culturally diverse are deviations from the norm.

The recognition of cultural influences on artistic development is another issue being addressed and evident in the recent cross-cultural literature in art education (Anderson, 1979; Eisner, 1979; Wilson & Wilson, 1979). The missing links in many of the earlier cross-cultural studies and in the Ives and Gardner overview are the contextual factors and the effect of prior experiences and education on the drawings of children. Ives and Gardner presented a glimpse of possible educational effects by citing a study that showed high performance of Japanese students on a visual intelligence test, which they "attributed to the overall emphasis within the culture on visual expression" (p. 21).

Cultural Influences: Some Critical Observations

A major concern we have with regard to all of the literature reviewed is the pervasive exclusion of prior experiences, the role of instruction, and environmental factors as variables in determining developmental stages. Environmental factors can modify, accelerate, impede, or atrophy growth, yet culture seldom appears as a variable in the studies we examined. Culturally diverse children as subjects for comparative analysis are noticeably absent. Cross-cultural perspectives in determining the universality of developmental stages in artistic growth are taken from existing and scattered sources, a weakness noted by Gardner and his associates also.

Conclusion

Project Zero and, in particular, Gardner, have made a major contribution to art education in the theoretical realm. Gardner's focus on the integration and extension of theories to explain the developmental process of artistic growth, central to which is the use and understanding of symbols, has received increasing attention in the field of art education. This body of work has an internal, logical consistency; Gardner articulates it into a masterfully integrated whole.

The potential of this theoretical base for illuminating some basic issues concerning artistic growth in children holds great promise. The testing of theory is the basis of research. The strength of this inquiry rests on the appropriateness of the means employed to test the experimental hypotheses. In our examination of the Project Zero literature, we have found consistent gaps and weaknesses in Gardner's translation of his theory into his experimental tasks, which has led us to question the validity of some of his results.

Project Zero offers a model of ten years' continuous and focused work to the rest of a profession whose chief research characteristic is a scattering of energy. We are inspired by Project Zero's productivity; we encourage them to continue just as energetically in the future. Whatever imperfections we can observe in Project Zero in no way diminish, in our view, their unique contributions to the theoretical and philosophical bases for inquiry in art education; they only point up the fact that Project Zero has identified and confronted difficult questions.

Our critique of Project Zero has raised certain issues that are common to all visual arts research. Let us now specify 10 goals toward which we all, as researchers, may work.

1. We must be truly multidisciplinary when we design our research and select methodology, drawing ideas and resources from wherever we can. First, let us read widely; perhaps publishing integrated literature reviews pertain-

ing to basic areas would be valuable. Second, let us follow Project Zero's teamwork example and undertake cooperative research. We need the kind of broad-ranging, long-term, sequential research that only many people working together can provide. Let us stop thinking of research as an individual activity occurring at isolated universities. Research teams could contain people from a number of schools and laboratories all across the country.

2. We must pay more attention to art and artists. We should work with people who have sophisticated art skills if we do not have them ourselves. How can we identify the artistically unique without expertise? Only the connoisseur can distinguish the exceptional from the common.

3. We must improve our research designs and data manipulations. The visual arts offer special problems in this regard because of the complexity of the stimuli and nature of the tasks involved.

4. We must account for the features of our subject populations. We should distinguish the effects of culture and education from developmental characteristics. In this process let us examine people from diverse walks of life.

5. We must scrutinize our experimental results critically and interpret them cautiously.

6. We must replicate our experiments and those of others to verify our results. We must sequence our experiments toward long-range objectives. Both may be done by more than one person through cooperative research.

7. We must study children's perceptual abilities that relate to the visual arts. We should learn to recognize visual concepts and how they form. We should look at what all of the arts have in common and how they differ.

8. We must ask the same questions of adults that we do of children. We need to establish parameters of adult behavior in the arts if we wish to understand children's artistic development.

9. We must study learning and teaching, and, in the process, perhaps reexamine the concepts of basic and applied research. We need to know how instruction affects artistic behavior. We need to improve the efficiency of teaching. We need to understand how education interacts with development; let us select subjects for developmental research who have participated in ongoing art programs.

10. We must support research in the visual arts. We can support it with our money, with research appointments in our universities, with time released from teaching, and with our recognition that research is a legitimate occupation for artists and educators.

This is a time of promise in our maturing profession, when challenges are great and so, therefore, are the opportunities for creative and satisfying work. Good research raises questions; defining problems, as Project Zero has done over the last decade, has given us many directions for imaginative study. The future, moreover, remains for all of us to shape.

Reference Notes

1. Rush, J. C. & Sabers, D. L. The perception of artistic style. *Studies in Art Education*, in press.
2. Hickey, D. The development and testing of a matrix of perceptual and cognitive abilities in art appreciation and criticism among children and adolescents. Unpublished doctoral dissertation, Indiana University, 1975.
3. Wolf, D. & Gardner, H. Beyond playing or polishing: A developmental view of artistry. Unpublished manuscript.
4. Ives, S. W. & Gardner, H. Cultural influences on children's drawings: A developmental perspective. In A. Hurwitz (Ed.), *Art education international.* Pennsylvania State University, in press.

References

Anderson, F. E. Approaches to cross-cultural research in art education. *Studies in Art Education,* 1979, **21** (1), 17-26.

Arnheim, R. *Visual thinking.* Berkeley: University of California Press, 1969.

Bengston, J. K., Schoeller, J., & Cohen, S. J. On conceptualizing an artistic style: How critical are examples? *Studies in Art Education,* 1979, **20** (1), 49-55.

Bloom, K. The arts in education, a new movement. In N. Shuker, *Arts in education partners: Schools and their communities.* New York: Georgian Press, 1977.

Brouch, V. An experimental study of the effect of synchronized slide-tape learning experiences on the tempera paintings of third and fourth grade children. *Studies in Art Education,* 1971, **12** (3), 31-42.

Carothers, T. & Gardner, H. When children's drawings become art: The emergence of aesthetic production and perception. *Developmental Psychology,* 1979, **15** (5), 570-580.

DePorter, D. A. & Kavanaugh, R. D. Parameters of children's sensitivity to painting styles. *Studies in Art Education,* 1979, **20** (1), 43.

Douglas, N. & Schwartz, J. Increasing awareness of art ideas of young children through guided experiences with ceramics. *Studies in Art Education,* 1967, **8** (2), 2-9.

Dubin, E. R. The effect of training on the tempo of development of graphic representation in preschool children. *Journal of Experimental Education,* 1946, **15,** 163-173.

Eisner, E. W. Cross-cultural research in arts education. *Studies in Art Education,* 1979, **21** (1), 27-35.

Gardner, H. Children's sensitivity to painting styles. *Child Development,* 1970, **41,** 813-821. (a)

Gardner, H. Effects of stimulus rearrangement on the development of sensitivity to painting styles. *Proceedings, 78th Annual Convention, APA,* 1970. (b)

Gardner, H. The development of sensitivity to artistic styles. *Journal of Aesthetics and Art Criticism,* 1971, **29,** 515-527.

Gardner, H. The development of sensitivity to figural and stylistic aspects of paintings. *British Journal of Psychology,* 1972, **63** (4), 605-615. (a)

Gardner, H. On figure and texture in aesthetic perception. *British Journal of Aesthetics,* 1972, **12** (1), 40-59. (b)

Gardner, H. Style sensitivity in children. *Human Development,* 1972, **15,** 325-338. (c)

Gardner, H. *The arts and human development.* New York: Wiley, 1973. (a)

Gardner, H. Children's sensitivity to musical styles. *Merrill-Palmer Quarterly,* 1973, **19,** 67-77. (b)

Gardner, H. The contribution of color and texture to the detection of painting styles. *Studies in Art Education,* 1974, **15** (3), 57-62.

Gardner, H. On the acquisition of first symbol systems. *Studies in the Anthropology of Visual Communication,* 1976 (3), 22-37. (a)

Gardner, H. Unfolding or teaching: On the optimal approach to art education. In E. Eisner (Ed.), *The arts, human development, and education.* Berkeley, CA: McCutchan Publishing, 1976. (b)

Gardner, H. Sifting the special from the shared: Notes toward an agenda for research in arts education. In S. S. Madeja (Ed.), *Arts and aesthetics: An agenda for the future.* St. Louis: CEMREL, Inc., 1977.

Gardner, H. *Artful scribbles.* New York: Basic Books, 1980.

Gardner, H. & Gardner, J. Developmental trends in sensitivity to painting style and subject matter. *Studies in Art Education,* 1970, **12** (1), 11-16.

Gardner, H. & Gardner, J. Children's literary skills. *Journal of Experimental Education,* 1971, **39,** 42-46.

Gardner, H. & Gardner, J. Developmental trends in sensitivity to form and subject matter in paintings. *Studies in Art Education,* 1973, **14,** 52-56.

Gardner, H., Winner, E., & Kircher, M. Children's conceptions of the arts. *Journal of Aesthetic Education,* 1975, **9** (3), 60-77.

Gardner, H., Wolf, D. S., & Smith, A. Artistic symbols in early childhood. *New York University Education Quarterly,* 1975, **VI** (4), 13-21.

Gilliatt, M. T. The effects of habituation, the Feldman-Mittler methodology, and studio activities on expanding art preferences of elementary students. *Studies in Art Education,* 1980, **21,** 43-49.

Golomb, C. *Young children's sculpture and drawing.* Cambridge, MA: Harvard University Press, 1977.

Goodman, N. *Languages of art* (Second Ed.). Indianaplis, IN: Hackett, 1976.

Goodnow, J. *Children drawing.* Cambridge, MA: Harvard University Press, 1977.

Grossman, M. Perceptual style, creativity and various drawing abilities. *Studies in Art Education,* 1970, **11** (2), 51-54.

Howard, V. A. Harvard Project Zero: A fresh look at art education. *Journal of Aesthetic Education,* 1971, **5** (1), 61-73.

Ives, W. S., Silverman, J., Kelly, H., & Gardner, H. Artistic development in the early school years: A crss media study of storytelling, drawing and clay modelling. *Technical Report #8,* Harvard Project Zero, Sept. 1979.

Kannegieter, R. The effects of a learning program in activity upon the visual perception of shape. *Studies in Art Education,* 1971, **12** (2), 18-27.

Kellogg, R. *Analyzing children's art.* Palo Alto, CA: National Press, 1969.

Knieter, G. & Stallings, J. *The teaching process & arts and aesthetics.* St. Louis: CEMREL, Inc., 1979.

Lowenfeld, V. *Creative and mental growth.* New York: Macmillan, 1947.

Madeja, S. S. (Ed.). *Arts and aesthetics: An agenda for the future.* St. Louis: CEMREL, Inc., 1977.

Madeja, S. S. (Ed.). *The arts, cognition, and basic skills.* St. Louis: CEMREL, Inc., 1978.

McFee, J. *Preparation for art.* Belmont, CA: Wadsworth Press, 1970.

McFee, J. & Degge, R. *Art, culture, and environment: A catalyst for teaching.* Belmont, CA: Wadsworth Press, 1977.

Murphy, J. & Jones, L. *Research in arts education: A federal chapter.* Washington, D.C.: U.S. Department of Health, Education, and Welfare, Office of Education, 1976.

National Endowment for the Arts. *Report of the task force on the education, training and development of professional artists and arts educators.* Washington, D.C., December, 1978.

Perkins, D. N. & Gardner, H. Harvard Project Zero: Moving from zero to one. *Harvard Graduate School of Education Association Bulletin,* 1974, **18** (2), 5-10.

Perkins, D. N. & Leondar, B. *The arts and cognition.* Baltimore, MD: Johns Hopkins University Press, 1977.

Rosario, J. Children's conceptions of the arts: A critical response to Howard Gardner. *Journal of Aesthetic Education,* 1977, **11** (1), 91-100.

Rosenstiel, A. K. & Gardner, H. The effect of critical comparisons upon children's drawings. *Studies in Art Education,* 1977, **19,** 36.

Rosenstiel, A. K., Morison, P., Silverman, J., & Gardner, H. Critical judgment: A developmental study. *Journal of Aesthetic Education,* 1978, **12,** 95-107.

Rush, J. C. Acquiring a concept of painting style. *Studies in Art Education,* 1979, **20** (3), 43-51.

Schapiro, M. In S. Tax (Ed.), *Anthropology today.* Chicago: University of Chicago Press, 1972.

Seefeldt, C. The effects of a program designed to increase young children's perception of texture. *Studies in Art Education,* 1979, **20** (2), 40-43.

Silverman, J., Winner, E., & Gardner, H. On going beyond the literal: The development of sensitivity to artistic symbols. *Semiotica,* 1976, **18,** 291-312.

Silverman, J., Winner, E., Rosenstiel, A. K., & Gardner, H. On training sensitivity to painting styles. *Perception,* 1975, **4,** 373-384.

Tighe, T. J. Concept formation and art: Further evidence on the applicability of Walk's technique. *Psychonomic Science,* 1968, **12** (8), 363-364.

Walk, R. D. Concept formation and art: Basic experiment and controls. *Psychonomic Science,* 1967, **9** (4), 237-238.

Walk, R. D., Karusaitis, K., Lebowitz, C., and Falbo, T. Artistic style as concept formation for children and adults. *Merrill-Palmer Quarterly,* 1971, **17** (4), 347-356.

Wilson, B. G. An experimental study designed to alter fifth and sixth grade students' perception of paintings. *Studies in Art Education,* 1966, **8** (1), 33-42.

Wilson, B. G. & Wilson, M. Figure structure, figure action, and framing in drawings by American and Egyptian children. *Studies in Art Education,* 1979, **21** (1), 36-43.

Jessie Lovano-Kerr
School of Education
Indiana University
Bloomington, Indiana 47405

Jean Rush
Department of Art
University of Arizona
Tucson, Arizona 85721

RESPONSE TO COMMENT ON PROJECT ZERO BY JESSIE LOVANO-KERR AND JEAN RUSH

Howard Gardner
Harvard Project Zero

I am grateful to Professors Jessie Lovano-Kerr and Jean Rush for the care they have taken in examining some of the work undertaken at Project Zero over the last decade. It is not possible, and possibly not appropriate, to respond to every point which they raise. Accordingly, in these notes, I will limit myself to some points of clarification about efforts being undertaken at Project Zero and to some corrections of errors of fact.

While it is flattering to be the center of attention of such a lengthy review, and to read the favorable comments dispensed by the authors, I must point out that Project Zero is in no sense synonymous with the work of myself and my immediate colleagues. The Project was founded by Nelson Goodman, a philosopher, is currently co-directed by David Perkins, a mathematician trained in artificial intelligence, and houses at any one time between 20 and 35 full-time and part-time researchers and students. We are not a monolith and no two members of the Project would respond to the present critique in the same manner. Moreover, starting from that whimsical Zero, we have in fact changed our thinking on nearly all points, sometimes slightly, sometimes dramatically. We ourselves have questioned nearly all of the results discussed here by our critics. What has not changed, however, are our beliefs in the utility of the developmental paradigm and in the ways in which experimental studies in aesthetics should be framed and executed.

Following the example of Piaget, we have always proceeded by outlining an "end-state" of competence within a particular artistic realm, devising tasks which make it possible to examine the development of the requisite operations across a range of ages, and then examining how this ability emerges in a sample of American children. We have sought to use stimuli which are as close to "real" works of art as possible, and to devise questions and procedures which are as natural and non-invasive as possible, while at the same time employing proper scientific procedures and controls. While we have not worked in élite private schools or in urban ghettos, our sampling has been quite broad and representative within the American context.

This policy has yielded a program of research, including certain areas of stress and certain points of relative neglect. We have deliberately sampled a wide range of artistic abilities, rather than focussing just on one or two. We have steered away from tasks in which one set of subjects might be much better trained or informed than another. We have noted sex differences and social class differences, when appropriate, but have not for the most part made such differences the center of our concern. Nor have we undertaken the enormously difficult task of trying to determine the exact background and training of our particular subjects. (However, following standard experimental practice, we have sampled a broad range of subjects so that any individual differences in training should, in the end, "average out.") Finally, again following Piaget's example, we have employed tasks which pose genuine difficulties for younger

subjects, tasks on which there is a reasonable chance that they will fail, thereby in the process revealing their presuppositions, strategies, and worldviews.

What we hope will emerge eventually from this program is an overview of how a certain set of artistic skills develops within the American context, in the absence of specific training regimens. In other words, much as Piaget, Lawrence Kohlberg, and William Damon have provided baseline developmental portraits in other seminal areas of human growth, we seek a first-order approximation to the natural developmental history of key artistic capacities. Against this background, it should then be possible to ascertain the flexibility of this portrait, the differences which background and training can make, the effects of intervention or of a highly unusual home or school setting, the role of individual differences, and the like. In other words, first, the approximation: then refinements, alterations or possibly even the scuttling of the initial model.

It is, or course, possible to follow other research strategies in the areas of artistic development and art education. My critics seem to favor an alternate approach, though they do not spell it out. They obviously feel that contexts and training are important. I agree. But I must question whether our scientific understanding, or even our non-scientific understanding, would be much enhanced by the kind of experimental program which they appear to espouse.

To be specific: We know, without doing any more studies, that training will help children. Indeed, if it does not, we simply draw the conclusion that the training program was no good. By the same token, we know that context influences a child's behavior; oftimes, in fact, context *is* the name of the game in educational psychology. To document these truisms once again is a waste of time. What seems worthwhile, however, is to take a coherent model of the child, one based, for example, on developmental studies, and to determine the effects of training and context under the rubric of such a model: to ascertain, for instance, which contexts work best at various ages and stages, which ones have relatively little effect, which yield the best short-term, long-term, medium-term gains, and the like. At the risk of seeming self-serving, then, I suggest that the kind of research approach apparently favored by my critics makes sense when undertaken in the wake of a theory or a model of artistic development, but not before and not otherwise.

So much for philosophy of research. Most of Professors Lovano-Kerr and Rush's paper consists of a set of criticisms, some quibbles, some more extensive, of research undertaken by the developmental group at Project Zero. Any study has flaws and ours certainly are no exception. Indeed, we undertake further studies in an effort to compensate for flaws, and we hope that our more recent research (and that of others) is more sophisticated due to our recognition of earlier mistakes and insufficiencies. Similarly, it should be noted that we have followed our own precepts, conducting training studies *after* our initial baseline studies have been carried out, and that our views have changed as a result of the training studies. This seems somewhat disconcerting to our critics, who seem to prefer that we not dirty our hands or our publications with training studies or with changes of mind, but I am afraid I cannot apologize for either practice.

Of the various criticisms, the one about the use of reproductions in our study of children's conceptions of arts seems most valid to me. Certainly the relation between responses based upon "real art works" and responses based upon reproductions deserves study, and I hope that someone will undertake

the study (although it is not as easy to do as it might at first seem). I would only add that the fact that we obtained essentially the same results whether we used reproductions or slides, and whether we questioned children about "paintings," poems, or songs, makes it unlikely that the use of reproductions has had a major impact on our results.

At a few points, I felt that my critics were being disingenuous. Thus, when they say that "lack of sensitivity to style seems consistent in all untrained subjects despite age," they ignore the obvious points of difference between lacking the concept of style altogether (as do young children) and having the concept but being unskilled in applying it and being able to overlook the subject matter of the artist (as do the older subjects). By the same token, when they criticize the stimuli in the Carothers and Gardner study for lack of artistic quality, they deliberately overlook the fact that it was necessary to use drawings which would not intimidate the children who had to complete them, and which had to be controlled on all variables save the ones being examined — repleteness and expressivity.

There were a few times in the paper where I felt that I was the intended victim of a hatchet job, and here I must strongly protest. It is claimed that "(this pattern of artistic development) is common to children of all cultures." On pages 159-160 of *Artful Scribbles,* I discuss the cross-cultural work of Alexander Alland and explicitly consider the possibility that "our developmental norms" are limited to children in a Western context who have had the opportunity to draw from an early age. It is claimed that our studies document "lack of progressive development in art skills," whereas in truth, nearly all of our studies document some growth in artistic skills and some of them actually document the effects of training. Finally, and most annoyingly, it is asserted that I regard "the natural unfolding of artistic development as inviolable" and that "intervention is a negative influence." In the very article in which I am alleged to hold this point of view, I take exactly the opposite position: namely, that intervention is helpful and necessary after the pre-school years. I have taken this position in the numerous articles I have written on the educational aspects of artistic development, and in my chapter on the subject in *Artful Scribbles.* I find it astonishing that my critics could attribute this position to me, unless they simply find it convenient to do so.

With respect to the charge that I ignore art educators and am "either unaware of or disinterested (sic) in many contemporary issues in the profession," I plead innocent. I am in favor of interdisciplinary exchange, and have sought to realize this orientation at Project Zero. To this ecumenical end, let me affirm that I have read Professor Lovano-Kerr's and Rush's Ten Commandments of Visual Arts Research, and I say, Amen.

I am grateful to the Spencer Foundation, the Carnegie Corporation, the Markle Foundation, the National Science Foundation, and the National Institute of Education for their generous support of the work undertaken at Project Zero.

Howard Gardner
Harvard Project Zero
Harvard University
Cambridge, Massachusetts 02138

Instructions for Authors

Manuscripts submitted to the **Review of Research in Visual Arts Education** should include an original and three copies. All manuscripts should follow policies outlined in the **Publication Manual** of the American Psychological Association, 2nd edition. Please send all manuscripts to:

Editorial Office
143 Art and Design Building
4th Street and Peabody Drive
University of Illinois
Champaign, Illinois 61820

Art Sinsabaugh, Photograph
Galena, Illinois, 1959

Courtesy of the Art Sinsabaugh Archive, Indiana University Art Museum


BOUND BY